



Federal Research and Development Funding: FY2010

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Summary

President Obama has requested \$147.620 billion for R&D in FY2010, a \$555 million (0.4%) increase from the estimated FY2009 R&D funding level of \$147.065 billion (not including FY2009 R&D funding provided under the American Recovery and Reinvestment Act (P.L. 111-5). According to the Obama Administration, preliminary allocations of R&D funding provided under P.L. 111-5 brings total FY2009 R&D funding to \$165.400 billion. Unless otherwise noted in this report, comparisons of FY2009 and FY2010 R&D funding do not incorporate funding provided under P.L. 111-5. To the extent possible, the agency discussions in this report include an analysis of House and Senate actions with respect to R&D funding. In some cases, however, there is insufficient information to parse agency R&D funding from other spending.

Congress will play a central role in defining the nation's R&D priorities, especially with respect to two overarching issues: the extent to which the Federal R&D investment can grow in the context of increased pressure on discretionary spending and how available funding will be prioritized and allocated. A low or negative growth rate in the overall R&D investment may require movement of resources across disciplines, programs, or agencies to address priorities.

Under the President's request, six federal agencies would receive 95.1% of total federal R&D spending: the Department of Defense (54.0%), Department of Health and Human Services (21.0%), National Aeronautics and Space Administration (7.7%), Department of Energy (7.3%), National Science Foundation (3.6%), and Department of Agriculture (1.5%). The President's FY2010 request includes \$30.884 billion for basic research; \$28.139 billion for applied research; \$84.054 billion for development; and \$4.543 billion for R&D facilities and equipment. The FY2010 request includes funding for three multiagency R&D initiatives: National Nanotechnology Initiative, \$1.637 billion; Networking and Information Technology R&D program, \$3.927 billion; and Climate Change Science Program, \$2.026 billion.

President Obama has requested increases in the R&D budgets of the three agencies that were targeted for doubling in the America COMPETES Act and by President Bush as part of his American Competitiveness Initiative: the Department of Energy Office of Science (up 3.5%), the National Science Foundation (up 8.6%), and the Department of Commerce National Institute of Standards and Technology's core research and facilities (up 1.2%).

Two of the regular appropriations bills, the Legislative Branch Appropriations Act, 2010 (P.L. 111-68) and the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2010 (P.L. 111-80), have been signed into law. Division B, the Continuing Appropriations Resolution, 2010, of P.L. 111-80 provides appropriations to all departments and agencies, including those that receive R&D funds, at FY2009 levels until October 31, 2010, until the enactment into law of an appropriation for any project or activity provided for in P.L. 111-68, or until the enactment into law of the applicable appropriations act for FY2010 without any provision for such project or activity, whichever occurs first.

For the past three years, federal R&D funding and execution has been affected by mechanisms used to complete the annual appropriations process—the year-long continuing resolution for FY2007 (P.L. 110-5) and the combining of multiple regular appropriations bills into the Consolidated Appropriations Act, 2008 for FY2008 (P.L. 110-161), and the Omnibus Appropriations Act, 2009 (P.L. 111-8). Completion of appropriations after the beginning of each fiscal year may cause agencies to delay or cancel some planned R&D and equipment acquisition.

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Overview

The 111th Congress continues to take a strong interest in the health of the U.S. research and development (R&D) enterprise and in providing sustained support for federal R&D activities. The United States government supports a broad range of scientific and engineering research and development. Its purposes include addressing specific concerns such as national defense, health, safety, the environment, and energy security; advancing knowledge generally; developing the scientific and engineering workforce; and strengthening U.S. innovation and competitiveness in the global economy. Most of the R&D funded by the federal government is performed in support of the unique missions of the funding agencies. The federal government has played an important role in supporting R&D efforts that have led to scientific breakthroughs and new technologies, from jet aircraft and the Internet to communications satellites and defenses against disease.

In May 2009, President Obama requested \$147.620 billion for R&D in FY2010, a 0.4% increase over the enacted FY2009 R&D funding level of \$147.065 billion (est.) (not including FY2009 R&D funding provided under the American Recovery and Reinvestment Act (P.L. 111-5)).¹ According to the Obama Administration, preliminary allocations of R&D funding provided under P.L. 111-5 brings total FY2009 R&D funding to \$165.400 billion.

The President's proposed FY2010 R&D funding includes an emphasis on increasing funding for the physical sciences and engineering, an effort consistent with the intent of the America COMPETES Act (P.L. 110-69) and President Bush's American Competitiveness Initiative (ACI). President Obama would achieve this objective largely through increased funding for the Department of Energy Office of Science and the National Science Foundation, and, to a lesser extent, the Department of Commerce National Institute of Standards and Technology's core laboratory research.

More broadly, in a speech before members of the National Academy of Sciences, President Obama put forth a goal of increasing the national investment in R&D to more than 3% of the U.S. gross domestic product (GDP). President Obama did not provide details on how this goal might be achieved (e.g., how much would be funded through increases in direct federal R&D funding or through indirect mechanisms such as the research and experimentation tax credit²), however doing so likely would require a substantial increase in public and private investment. In 2007, total U.S. R&D expenditures were \$368.1 billion,³ or approximately 2.7% of GDP.⁴ Based on 2007 figures, reaching President Obama's 3% goal would require a 12.5% real increase in national R&D funding. Increasing direct Federal R&D funding by 12.5% in FY2010 would require an increase of more than \$18 billion above President Obama's request.

¹ Funding levels included in this document are in current dollars unless otherwise noted. Inflation diminishes the purchasing power of federal R&D funds, so an increase that does not equal or exceed the inflation rate may reduce real purchasing power.

² The research and experimentation tax credit is referred to frequently as the research and development tax credit or R&D tax credit, through the credit does not apply to development expenditures.

³ National Science Foundation, *National Patterns of R&D Resources: 2007 Data Update*, NSF 08-318, Arlington, VA, 2008, <http://www.nsf.gov/statistics/nsf08318/>.

⁴ Based on 2007 U.S. GDP of \$13,807.5 billion as reported by the U.S. Department of Commerce Bureau of Economic Analysis, National Income and Product Accounts Table, Table 1.1.5.

In addition, advocates for increased federal R&D funding—including President Obama’s science advisor, John Holdren—have raised concerns about the potential negative effects of a “boom-bust” approach to federal R&D funding, i.e., rapid growth in federal R&D funding followed by much slower growth, flat funding, or even decline.⁵ The biomedical research community experienced a variety of challenges resulting from such a circumstance following the five-year doubling of the NIH budget that was completed in FY2003. With the NIH doubling came a rapid expansion of the nation’s biomedical research infrastructure (e.g., buildings, laboratories, equipment), as well as rapid growth in university faculty hiring, students pursuing biomedical degrees, and grant applications to NIH. After the doubling, however, the agency’s budget fell each year in real terms from FY2004 to FY2009. Critics assert a variety of adverse effects of this boom-bust cycle, including interruptions and cancellations of promising research, declining share in the number of NIH grant proposals funded, decreased student interest in pursuing graduate studies, and reduced employment prospects for the large number of biomedical researchers with advanced degrees. According to then-NIH Director Elias Zerhouni, the adverse ramifications have been particularly acute for early- and mid-career scientists seeking a first or second grant.^{6,7}

Analysis of federal R&D funding is complicated by several factors, including the Obama Administration’s omission of Congressionally directed spending from the FY2010 budget request and inconsistency among agencies in the reporting of R&D. Another complicating factor for FY2009 and FY2010 is the inclusion of funding for R&D, facilities, and equipment, and related activities in the American Recovery and Reinvestment Act of 2009 (ARRA, P.L. 111-5). ARRA funds supplement funding provided to agencies in P.L. 110-329 and P.L. 111-8. Some ARRA funding will be spent in FY2009 and the balance of these funds will be spent in subsequent years. For purposes of this report, unless otherwise noted, comparisons of FY2009 and FY2010 R&D funding do not incorporate funding provided under P.L. 111-5. As a result of these and other factors, the R&D agency figures reported by the White House Office of Management and Budget (OMB) and White House Office of Science and Technology Policy (OSTP) (and shown in **Table 1**) may differ somewhat from the agency budget analyses that appear later in this report.

Federal R&D Funding Perspectives

Federal R&D funding can be analyzed from a variety of perspectives that provide unique insights.

Agency Perspective

The authorization and appropriations process views federal R&D funding primarily from agency and program perspectives. **Table 1** provides data on R&D by agency for FY2008 (actual), FY2009 (estimate), ARRA, and FY2010 (request) as reported by OMB. Under President Obama’s FY2010 budget request, six federal agencies would receive 95.1% of total federal R&D funding: the Department of Defense (DOD), 54.0%; the Department of Health and Human Services (HHS) (primarily the National Institutes of Health (NIH)), 21.0%; the National Aeronautics and Space

⁵ Jennifer Couzin and Greg Miller, “NIH Budget: Boom and Bust,” *Science*, vol. 316, no. 5823 (April 2007), pp. 356-361, at <http://www.scienceline.org/cgi/content/full/316/5823/356>.

⁶ Ibid.

⁷ For additional information on NIH R&D funding issues, see CRS Report RL33695, *The National Institutes of Health (NIH): Organization, Funding, and Congressional Issues*, by Pamela W. Smith.

Administration (NASA), 7.7%; the Department of Energy (DOE), 7.3%; the National Science Foundation (NSF), 3.6%; and the Department of Agriculture (USDA), 1.5%. This report provides an analysis of the R&D budget requests for these agencies, as well as for the Departments of Commerce (DOC), Homeland Security, the Interior (DOI), and Transportation (DOT), and the Environmental Protection Agency (EPA). In total, these departments and agencies accounted for more than 98% of current and requested federal R&D funding.

In his FY2010 budget request, President Obama stated his intention to double the federal investment in three basic-research agencies over a decade from their FY2006 levels: DOE's Office of Science (up 3.9% above the estimated FY2009 level), NSF (up 9.4%), and DOC's National Institute of Standards and Technology (NIST) laboratories and construction funds (up 1.2%).⁸ This effort essentially continues the American Competitiveness Initiative (ACI) initiated by President Bush to double physical sciences and engineering research in these agencies over ten years (FY2007-FY2016). In 2007, Congress authorized substantial R&D increases for these agencies under the America COMPETES Act (P.L. 110-69), setting a more aggressive seven-year doubling course.⁹

The largest agency R&D increases in the President's FY2010 request are for NASA, \$1.038 billion; the Department of Health and Human Services, \$521 million (due primarily to a \$436 million increase in R&D funding for NIH); and the National Science Foundation, \$455 million. DOD R&D funding would be reduced by \$1.929 billion in FY2010, and USDA R&D funding would be cut by \$149 million.¹⁰

⁸ *The President's Plan for Science and Innovation: Doubling Funding for Key Basic Research Agencies in the FY2010 Budget*, Office of Science and Technology Policy, The White House, May 7, 2009, available at <http://www.ostp.gov/galleries/budget/doubling.pdf>.

⁹ For additional information, see CRS Report RL34328, *America COMPETES Act: Programs, Funding, and Selected Issues*, by Deborah D. Stine.

¹⁰ *A Renewed Commitment to Science and Technology: Federal R&D, Technology, and STEM Education in the 2010 Budget*, Office of Science and Technology Policy, The White House, May 7, 2009, available at <http://www.ostp.gov/galleries/budget/FY2010RD.pdf>.

Table 1. Federal Research and Development Funding by Agency, FY2008-FY2010
(Budget authority, dollar amounts in millions)

Department/Agency	FY2008 Actual	FY2009 Estimate	FY2009 ARRA	FY2010 Request	Dollar Change, 2009 to 2010	Percent Change, 2009 to 2010
Agriculture	2,336	2,421	176	2,272	-149	-6.2
Commerce	1,160	1,292	411	1,330	38	2.9
Defense	80,278	81,616	300	79,687	-1,929	-2.4
Energy	9,807	10,621	2,446	10,740	119	1.1
Environmental Protection Agency	551	580	0	619	39	6.7
Health and Human Services	29,265	30,415	11,103	30,936	521	1.7
Homeland Security	995	1,096	0	1,125	29	2.6
Interior	683	692	74	730	38	5.5
NASA	11,182	10,401	925	11,439	1,038	10.0
National Science Foundation	4,580	4,857	2,900	5,312	455	9.4
Transportation	875	913	0	939	26	2.8
Veterans Affairs	960	1,020	0	1,160	140	13.7
Other	1,074	1,141	0	1,331	190	16.7
Total^a	143,746	147,065	18,335	147,620	555	0.4

Sources: *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2010*, Table 5-1, Office of Management and Budget, The White House, May 2009; *A Renewed Commitment to Science and Technology: Federal R&D, Technology, and STEM Education in the 2010 Budget*, Table 1, Office of Science and Technology Policy, The White House, May 7, 2009.

Note:

a. Totals may differ from the sum of the components due to rounding.

Character of Work, Facilities, and Equipment Perspective

Federal R&D funding can also be examined by the character of work (basic research, applied research, and development) it supports, and funding provided for facilities and acquisition of major R&D equipment (see **Table 2**). President Obama's FY2010 request includes \$30.884 billion for basic research, up \$1.003 billion (3.4%) from FY2009; \$28.139 billion for applied research, down \$627 million (-2.2%); \$84.054 billion for development, up \$167 million (0.2%); and \$4.543 billion for facilities and equipment, up \$12 million (0.3%).

Table 2. Federal Research and Development Funding by Character of Work, Facilities, and Equipment, FY2008-FY2010

(Budget authority, dollar amounts in millions)

	FY2008 Actual	FY2009 Estimate	FY2009 ARRA	FY2010 Request	Dollar Change, 2009 to 2010	Percent Change, 2009 to 2010
Basic research	28,613	29,881	11,365	30,884	1,003	3.4
Applied research	27,413	28,766	1,920	28,139	-627	-2.2
Development	83,254	83,887	1,408	84,054	167	0.2
Facilities & equipment	4,466	4,531	3,642	4,543	12	0.3
Total^a	143,746	147,065	18,335	147,620	555	0.4

Source: A Renewed Commitment to Science and Technology: Federal R&D, Technology, and STEM Education in the 2010 Budget, Office of Science and Technology Policy, The White House, May 7, 2009.

Note:

- a. Totals may differ from the sum of the components due to rounding.

Combined Perspective

Combining these perspectives, federal R&D funding can be viewed in terms of each agency's contribution to basic research, applied research, development, and facilities and equipment (see **Table 3**). The federal government is the nation's largest supporter of basic research (funding an estimated 59.0% of U.S. basic research in 2007),¹¹ primarily because the private sector asserts it cannot capture an adequate return on long-term fundamental research investments. In contrast, industry funded only 15.9% of U.S. basic research in 2007. In FY2009, the Department of Health and Human Services (primarily HHS's National Institutes of Health (NIH)) accounts for more than half of all federal funding for basic research.¹²

In contrast to basic research, industry is the primary funder of applied research in the United States, accounting for an estimated 61.1% in 2007, while the federal government accounted for an estimated 31.3%.¹³ Among federal agencies, HHS is the largest funder of applied research, accounting for nearly half of all federally funded applied research in FY2009.¹⁴

Industry also provides the vast majority of funding for development, accounting for an estimated 83.2% in 2007, while the federal government provided an estimated 15.7%.¹⁵ DOD is the primary

¹¹ *National Patterns of R&D Resources: 2007 Data Update*, NSF 08-318, National Science Foundation, 2008. Available at <http://www.nsf.gov/statistics/nsf08318/>

¹² *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2010*, Table 5-1, Office of Management and Budget, The White House, May 2009.

¹³ *National Patterns of R&D Resources: 2007 Data Update*, NSF 08-318, National Science Foundation, 2008. Available at <http://www.nsf.gov/statistics/nsf08318/>.

¹⁴ *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2010*, Table 5-1, Office of Management and Budget, The White House, May 2009.

¹⁵ *National Patterns of R&D Resources: 2007 Data Update*, NSF 08-318, National Science Foundation, 2008. Available at <http://www.nsf.gov/statistics/nsf08318/>.

federal agency funder of development, accounting for 87.6% of total federal development funding in FY2009.¹⁶

Table 3. Top R&D Funding Agencies by Character of Work, Facilities and Equipment, FY2008-FY2010

(Budget authority, dollar amounts in millions)

	FY2008 Actual	FY2009 Estimate^a	FY2010 Request
Basic Research			
Health and Human Services	15,739	25,035	16,739
National Science Foundation	3,704	6,045	4,477
Energy	3,461	4,425	3,813
Applied Research			
Health and Human Services	13,349	14,813	14,027
Defense	4,855	5,174	4,236
Energy	3,180	3,810	3,093
Development			
Defense	73,615	74,714	73,603
NASA	6,090	6,244	6,246
Energy	2,281	2,945	2,614
Facilities and Equipment			
NASA	2,349	2,194	2,365
Energy	885	1,887	1,220
National Science Foundation	456	1,312	412

Source: *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2010*, Office of Management and Budget, The White House, May 2009.

Note: Top funding agencies based on FY2010 request.

a. Amounts for 2009 include funding from P.L. 111-5.

Multi-Agency R&D Initiatives Perspective

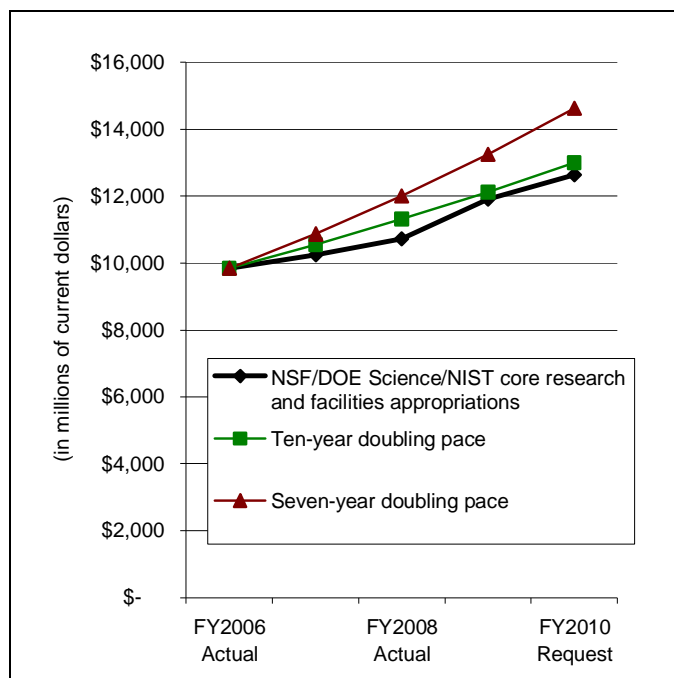
Federal R&D funding can also be viewed in terms of multi-agency efforts, such as the National Nanotechnology Initiative (see “FY2010 Federal R&D Appropriations Status” section below), and presidential initiatives, such as the Bush Administration’s American Competitiveness Initiative (ACI).

¹⁶ *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2010*, Table 5-1, Office of Management and Budget, The White House, May 2009.

President Obama has stated that he will seek to double funding for basic research over ten years at the agencies comprising the ACI—NSF, DOE’s Office of Science, and NIST. Congress established authorization levels for FY2008-FY2010 in the America COMPETES Act that would put funding for research at these agencies on track to double in approximately seven years. However, FY2008 research funding provided in the Consolidated Appropriations Act, 2008 (P.L. 110-161) for these agencies fell below these doubling targets. **Figure 1** illustrates how actual, estimated and requested appropriations (for FY2006 through FY2010) compare to seven- and ten-year doubling rates.

For FY2010, President Obama has proposed \$12.638 billion in funding for NSF, DOE’s Office of Science, and NIST’s core research and facilities, an increase of \$731 million (6.1%) above the FY2009 funding level of \$11.907 billion. For FY2009, Congress appropriated an estimated \$11.907 billion in funding for these agencies, an increase of \$1.176 billion (11.0%) above the FY2008 level of \$10.731 billion. The American Recovery and Reinvestment Act of 2009 (P.L. 111-5) also provides funding for each of the three ACI agencies totaling approximately \$5.182 billion (in addition to the enacted levels in P.L. 110-329) (see **Table 4**). Estimated FY2008 funding for ACI research totaled \$10.731 billion, an increase of approximately \$485 million (4.7%) over the FY2007 ACI funding level.

Figure 1. Doubling of Research Funding: Appropriations versus Selected Rates



Source: Prepared by the Congressional Research Service (CRS) using data from the sources cited in Table 4; appropriations data does not include funding providing by the American Recovery and Reinvestment Act of 2009.

Note: The ten-year doubling pace assumes annual increases of 7.2% each year for ten years. The seven-year double pace assumes annual increases of 10.4% each year for seven years. Through compounding, these rates achieve the doubling of funding in the desired time period.

Table 4. Agencies Targeted for Research Doubling by President Obama, the America COMPETES Act, and the American Competitiveness Initiative

(dollar amounts in millions)

Agency	FY2006 Actual	FY2007 Actual	FY2008 Actual	FY2009 Estimate	FY2009 ARRA	FY2010 Request
National Science Foundation	5,646	5,917	6,092	6,490	3,002	7,045
Department of Energy/Office of Science	3,632	3,836	4,036	4,773	1,600	4,942
National Institute of Standards and Technology/core research ^a	395	434	441	472	220	535
National Institute of Standards and Technology/facilities	174	59	160	172	360	117
Total^b	9,846	10,246	10,731	11,907	5,182	12,638

Sources: *The President's Plan for Science and Innovation: Doubling Funding for Key Basic Research Agencies in the 2010 Budget*, Office of Science and Technology Policy, The White House, May 7, 2009; *National Institute of Standards and Technology, Fiscal Year 2010 NIST Budget Submission to Congress*, National Institute of Standards and Technology, May 2009; CRS Report 95-30, *The National Institute of Standards and Technology: An Appropriations Overview*, by Wendy H. Schacht; *FY2008 Department of Energy Budget Request to Congress*, Department of Energy, February 2008; *FY2009 Department of Energy Budget Request to Congress*, Department of Energy, February 2008; *NIST Appropriations Summary, FY2006-2008*, National Institute of Standards and Technology; *NSF Summary Tables, FY2008 Budget Request to Congress*, National Science Foundation, February 5, 2007.

Notes:

- a. NIST core research activities are those performed under its Scientific and Technical Research and Services account.
- b. Totals may differ from the sum of the components due to rounding.

FY2010 Federal R&D Appropriations Status

As of October 8, 2009, the House has passed all twelve of the regular FY2010 appropriations bills; the Senate has passed seven. Conference reports have been produced for the Agriculture and Energy and Water appropriations bills; the House has agreed to each. Action has been completed on one of twelve regular appropriations bills. The Legislative Branch Appropriations Act, 2010 (P.L. 111-68) was signed into law by President Obama on September 30, 2009. Division B of the act, the Continuing Appropriations Resolution, 2010, provides appropriations to all departments and agencies, including those that receive R&D funds, at FY2009 levels until October 31, 2010, until the enactment into law of an appropriation for any project or activity provided for in P.L. 111-68, or until the enactment into law of an appropriation for any project or activity provided for in the act, or the enactment into law of the applicable appropriations act for FY2010 without any provision for such project or activity, whichever occurs first.

Multiagency R&D Initiatives

President Obama's FY2010 budget request provides funding for three multiagency R&D initiatives. Funding for the National Nanotechnology Initiative (NNI) is requested in the amount

of \$1.637 billion for FY2010, \$17 million (-1.0%) below the estimated FY2009 level of \$1.654 billion.¹⁷ The overall decrease in the FY2010 NNI funding request is due to a \$85 million decrease (-18.3%) in funding for DOD nanotechnology R&D compared to its estimated FY2009 funding level. This decrease is offset somewhat by increases in other agencies, including NSF (up \$26 million, 6.5%); HHS, including the NIH and the Centers for Disease Control and Prevention (up \$19 million, 6.1%); and DOE (up \$15 million, 4.4%).¹⁸

President Obama has requested \$3.927 billion in FY2010 funding for the Networking and Information Technology Research and Development (NITRD) program, \$44 million (1.1%) above the estimated FY2009 level of \$3.882 billion.¹⁹ The requested NITRD increase was due primarily to requested funding increases for NSF (up \$107 million, 10.6%) and DOE (up \$48 million, 10.9%), and offset, in part, by a proposed decrease in NITRD funding for DOD (down \$140 million, -10.9%).²⁰

The Obama Administration has proposed \$2.026 billion for the Climate Change Science Program (CCSP) in FY2010, \$46 million (2.3%) above the estimated FY2009 level of \$1.980 billion.^{21, 22} Two agencies would receive the bulk of the FY2010 CCSP funding increase: NSF (up \$80 million, 36.4%) and DOI's U.S. Geological Survey (up \$18 million, 40.0%). The increase in these and other agencies' CCSP proposed FY2010 funding is offset, in part, by reductions in proposed funding for DOC's National Oceanic and Atmospheric Administration (NOAA) (down \$72 million, -19.5%) and NASA (down \$15 million, -1.4%).²³

Department of Defense²⁴

Congress supports research and development in the Department of Defense (DOD) through its Research, Development, Test, and Evaluation (RDT&E) appropriation. The appropriation primarily supports the development of the nation's future military hardware and software and the technology base upon which those products rely.

¹⁷ The estimated FY2009 NNI funding level of \$1.65 billion does not include an estimated \$140 million in nanotechnology research and development funded under P.L. 111-5.

A Renewed Commitment to Science and Technology: Federal R&D, Technology, and STEM Education in the 2010 Budget, Office of Science and Technology Policy, The White House, May 7, 2009.

¹⁸ For additional information on the NNI, see CRS Report RL34401, *The National Nanotechnology Initiative: Overview, Reauthorization, and Appropriations Issues*, by John F. Sargent Jr.

¹⁹ The estimated FY2009 NITRD funding level of \$3.89 billion does not include an estimated \$706 million in networking and information technology research and development funded under P.L. 111-5.

²⁰ *A Renewed Commitment to Science and Technology: Federal R&D, Technology, and STEM Education in the 2010 Budget*, Office of Science and Technology Policy, The White House, May 7, 2009.

For additional information on NITRD, see CRS Report RL33586, *The Federal Networking and Information Technology Research and Development Program: Funding Issues and Activities*, by Patricia Moloney Figliola.

²¹ The estimated FY2009 CCSP funding level of \$1.98 billion does not include an estimated \$461 million in climate change research and development funded under P.L. 111-5.

²² *A Renewed Commitment to Science and Technology: Federal R&D, Technology, and STEM Education in the 2010 Budget*, Office of Science and Technology Policy, The White House, May 7, 2009.

²³ For additional information on the CCSP, see CRS Report RL33817, *Climate Change: Federal Program Funding and Tax Incentives*, by Jane A. Leggett.

²⁴ This section was written by John Moteff, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

Nearly all of what DOD spends on RDT&E is appropriated in Title IV of the defense appropriation bill (see **Table 5**). However, RDT&E funds are also appropriated in other parts of the bill. For example, RDT&E funds are appropriated as part of the Defense Health Program and the Chemical Agents and Munitions Destruction Program. The Defense Health Program supports the delivery of health care to DOD personnel and their families. Program funds are requested through the Operations and Maintenance appropriation. The program's RDT&E funds support Congressionally directed research in such areas as breast, prostate, and ovarian cancer and other medical conditions. The Chemical Agents and Munitions Destruction Program supports activities to destroy the U.S. inventory of lethal chemical agents and munitions to avoid future risks and costs associated with storage. Funds for this program have been requested through the Army Procurement appropriation. The Joint Improvised Explosive Device Defeat Fund (JIEDDF) also contains additional RDT&E monies. However, the fund does not contain an RDT&E line item as do the two programs mentioned above. The Joint Improvised Explosive Device Defeat Office, which now administers the fund, tracks (but does not report) the amount of funding allocated to RDT&E. The JIEDDF funding is not included in the tables below. Typically, Congress has funded each of these programs in Title VI (Other Department of Defense Programs) of the defense appropriations bill.

RDT&E funds also have been requested and appropriated as part of DOD's separate funding to support efforts in what the Bush Administration had termed the Global War on Terror (GWOT), and what the Obama Administration refers to as Overseas Contingency Operations (OCO). Typically, the RDT&E funds appropriated for GWOT/OCO activities go to specified Program Elements (PEs) in Title IV. However, they are requested and accounted for separately. The Bush Administration requested these funds in separate GWOT emergency supplemental requests. The Obama Administration, while continuing to identify these funds uniquely as OCO requests, has included these funds as part of the regular budget, not as an emergency supplemental. In addition, GWOT/OCO-related requests/appropriations often include money for a number of transfer funds. These include the Iraqi Freedom Fund (IFF), the Iraqi Security Forces Fund, the Afghanistan Security Forces Fund, the Mine Resistant and Ambush Protected Vehicle Fund (MRAPVF), and, beginning in FY2010, the Pakistan Counterinsurgency Capability Fund. Congress typically makes a single appropriation into each of these funds, and authorizes the Secretary to make transfers to other accounts, including RDT&E, at his discretion.

For FY2010, the Obama Administration requested \$78.634 billion for DOD's baseline Title IV RDT&E, roughly \$2 billion (2%) less than Congress appropriated for baseline Title IV in FY2009. The FY2010 requests for RDT&E in the Defense Health Program and the Chemical Agents and Munitions Destruction program were \$613 million and \$401 million, respectively. In addition, the Obama Administration requested \$310 million in OCO-related RDT&E.

RDT&E funding can be broken out in a couple of ways. Each of the military departments request and receive their own RDT&E funding. So, too, do various DOD agencies (e.g., the Missile Defense Agency and the Defense Advanced Research Projects Agency), collectively aggregated within the Defensewide account. RDT&E funding also can be characterized by budget activity (i.e., the type of RDT&E supported). Those budget activities designated as 6.1, 6.2, and 6.3 (basic research, applied research, and advanced development, respectively) constitute what is called DOD's Science and Technology Program (S&T) and represent the more research-oriented part of the RDT&E program. Budget activities 6.4 and 6.5 focus on the development of specific weapon systems or components (e.g., the Joint Strike Fighter or missile defense systems), for which an operational need has been determined and an acquisition program established. Budget activity 6.7

supports system improvements in existing operational systems. Budget activity 6.6 provides management support, including support for test and evaluation facilities.

Congress is particularly interested in S&T funding since these funds support the development of new technologies and the underlying science. Ensuring adequate support for S&T activities is seen by some in the defense community as imperative to maintaining U.S. military superiority. This was of particular concern at a time when defense budgets and RDT&E funding were falling at the end of the Cold War. As part of its 2001 Quadrennial Review, DOD established a goal of stabilizing its baseline S&T funding (i.e., Title IV) at 3% of DOD's overall funding. Congress has embraced this goal.

The FY2010 baseline S&T funding request in Title IV was \$11.650 billion, about \$1.837 billion (13.6%) less than what Congress appropriated for baseline S&T in Title IV in FY2009 (not counting S&T's share of the \$218 million general reduction in RDT&E for revised economic assumptions). Furthermore, the S&T request for baseline Title IV was approximately 2.2% of the overall baseline DOD budget request (\$533.8 billion, not counting funds for the Global War on Terror), short of the 3% goal.

Within the S&T program, basic research (6.1) receives special attention, particularly by the nation's universities. DOD is not a large supporter of basic research, when compared to the National Institutes of Health or the National Science Foundation. However, over half of DOD's basic research budget is spent at universities and represents the major contribution of funds in some areas of science and technology (such as electrical engineering and material science). The FY2010 request for basic research (\$1.798 billion) was roughly \$44 million (2%) less than what Congress appropriated for Title IV basic research in FY2008.

The House passed its version of the FY2010 defense appropriations bill (H.R. 3326) on July 30. The House approved \$80.2 billion for baseline Title IV RDT&E. This included \$13.2 billion for S&T, of which \$1.9 billion was for basic research. In addition, the House approved \$1.3 billion for RDT&E in the Defense Health Program. This includes a technical revision approved on the House floor that shifted \$26 million from the operations account to the RDT&E account. The House presumably approved the full \$401 million request for RDT&E within the Chemical Agents and Munitions Destruction program. The committee report (H.Rept. 111-230) had recommended a cut of \$50 million in the program's RDT&E account. The House voted to add \$50 million back into the program, although the amendment did not specify that it was added to the RDT&E account. The House approved \$214 million in RDT&E for Overseas Contingency Operations, reducing the Navy's request substantially by declaring three of the line item requests as being either non-emergency-related or as being insufficiently justified.

The Senate passed its version of the FY2010 defense appropriations bill on October 6. The Senate approved \$78.450 billion for baseline Title IV RDTE. This included \$12.319 billion for S&T, of which \$1.785 billion was for basic research. In addition, the Senate approved \$999 million for RDT&E in the Defense Health Program and \$401 million for RDT&E in the Chemical Agents and Munitions Destruction program. The Senate also reduced the OCO RDT&E request, providing \$294 million, reducing the Navy and Defensewide requests, while increasing the Air Force request (part of which was due to a transfer request by the Air Force).

Major differences between the House and Senate version, in terms of dollars, include how to reallocate funds within the Army's Future Combat System program (restructured earlier this year by DOD), the Army's Aerial Common Sensor program (which the House fully supported and the

Senate eliminated), the Navy's Executive Helicopter Development program (for which the House provided \$400 million more than the budget request and the Senate reduced to \$55 million), the Air Force's Next Generation Tanker Development program (where the House chose to provide \$440 million to the Tanker Replacement Transfer Fund while the Senate provided \$410 million as requested in the Air Force's Title IV account), and the Joint Strike Fighter programs of the Navy and Air Force (from which the Senate cut \$293 million each). In regard to the OCO budget, the Senate fully funded the Navy's Manned Surveillance Systems OCO request, while the House zeroed the request citing insufficient justification.

The House passed its version of the bill (H.R. 2346) on May 14, 2009. The Senate passed its version, S. 1054, on May 21 (S.Rept. 111-20). The conference committee reported its version on June 12, 2009. The Administration requested \$810 million in Title IV RDT&E funds, the House provided \$722 million, the Senate recommended \$886 million, and the conference committee recommended \$833 million. The funds would be used to accelerate the development, testing, and demonstration of technologies and equipment needed in Iraq and Afghanistan. In addition, the Administration requested \$34 million in RDT&E funding within the Defense Health Program for research in information technologies in support of the Wounded, Ill, and Injured program. The House provided \$201 million, \$168 million of which is directed toward additional research in traumatic brain injuries, psychological health, and orthopedics. The Senate recommended the requested level of \$34 million. The conference committee recommended \$160 million. As the total figures indicate, there are some substantial differences between the House and Senate versions. For example, the House sought to zero the Manned Reconnaissance Systems request of the Navy, the Senate sought to increase the request by \$26 million. The Senate also added \$61 million to the Air Force request for LINK 16 Support and Sustainment, which was not in the original request or the House version. Finally, the House voted to substantially increase RDT&E funding in the Defense Health Program, while the Senate did not recommend any additional funds beyond the request.

The conference committee appears to have split the differences between the House and Senate versions, nominally taking House recommendations in the Navy and Defensewide accounts and the Senate recommendations in the Army and Air Force Accounts. The conference also nominally split the difference in its recommendation for RDT&E in the Defense Health Program. The House passed the conference bill on June 16; the Senate passed it on June 18. President Obama signed the act (P.L. 111-32) on June 24, 2009.

On February 13, 2009, Congress passed the American Recovery and Reinvestment Act of 2009. The final version of the bill, P.L. 111-5, appropriated \$300 million for DOD Title IV RDT&E. These funds remain available for obligation through September 30, 2010. According to the May 15, 2009 update of Recovery.gov, DOD intended to have begun awarding contracts in May and completing the awards by February 2010.

Table 5. Department of Defense RDT&E

(in millions of dollars)

	FY2009 Estimate				FY2010 Request		House FY2010		Senate FY2010	
	Base enacted	OCO enacted	OCO Supp. Enacted	ARRA Enacted ^a	Base	OCO	Base	OCO	Base	OCO
Army	12,060		53	75	10,438	58	11,152	58	10,653	58
Navy	19,764	113	137	75	19,271	107	20,197	38	19,149	84
Air Force	27,084	72	160	75	27,993	29	27,976	29	28,049	39
Defensewide	21,423	203	483	75	20,742	116	20,722	116	20,409	112
Dir. Test & Eval	189				191		191		191	
Adjustments, improved economic assumptions	(218)									
Total Title IV - By Account^b	80,303	388	833	300	78,634	310	80,238	241	78,450	294
6.1 Basic Research	1,842				1,798		1,931		1,785	
6.2 Applied Research	5,113		2		4,247		4,927		4,605	
6.3 Advanced Development	6,532				5,605		6,325		5,929	
6.4 Advanced Component Development and Prototypes	15,817		3		14,306	17	14,609	0	14,630	0
6.5 Systems Dev. and Demo	18,654		111		17,845	19	17,627	18	16,793	19
6.6 Management Support ^c	4,543		28		4,557	0	4,581	3	4,603	0
6.7 Op. Systems Dev ^d	28,020	388	690		30,276	275	30,438	220	30,105	275

	FY2009 Estimate				FY2010 Request		House FY2010		Senate FY2010	
	Base enacted	OCO enacted	OCO Supp. Enacted	ARRA Enacted ^a	Base	OCO	Base	OCO	Base	OCO
Adjustments, improved economic assumptions	(218)									
DARPA General Reduction							(200)			
Total Title IV - by Budget Activity ^b	80,303	388	834	300	78,634	310	80,238	241	78,450	294
Title VI - Other Defense Programs										
Defense Health Program	903		160		613		1,275		999	
Chemical Agents and Munitions Destruction	289				401		401		401	
Grand Total	81,495	388	993	300	79,648	310	81,914	241	79,850	294

Sources: CRS, adapted from the Department of Defense Budget, Fiscal Year 2010, RDT&E Programs (R-1), May 2009. The FY2009 Base enacted estimate taken from P.L. 110-329 and the Congressional Record version of the DOD explanatory statement, Sept. 24, 2008. The FY2009 OCO enacted estimate was taken from P.L. 110-252, chapter 2. The FY2009 OCO supplemental enacted figures were taken from H.Rept. 111-151. The Defense Health Program figures taken from the Defense Health Program FY2010 Budget Estimates, Exhibit R-1, RDT&E Programs. Chemical Agents and Munitions Destruction Program figures taken from Chemical Agents and Munitions Destruction FY2010 Budget Estimates, May 2009.

Notes:

- a. On February 13, 2009, Congress passed the American Recovery and Reinvestment Act of 2009 (P.L. 111-5). The act included \$300 million in RDT&E funding.
- b. Total Budget Authority for Account and Budget Activity may not agree due to rounding.
- c. Includes funds for Developmental and Operational Test and Evaluation.
- d. Includes funding for classified programs.

Table 6. RDT&E Funding in FY2009 Overseas Contingency Operations
(in millions of dollars)

	FY2009 OCO Supplemental			
	Request	H.R. 2346	S. 1054	H.R. 2346 Enacted
OCO-Related Title IV				
By Account				
Army	74	74	72	53
Navy	145	96	142	137
Air Force	108	93	174	160
Defensewide	483	459	498	483
Dir. Test & Eval				
Total Budget Auth.^a	810	722	886	833
By Budget Activity				
6.1 Basic Research				
6.2 Applied Research				2
6.3 Advanced Development		2		
6.4 Advanced Component Dev. and Prototypes	7	7	3	3
6.5 Sys. Dev. and Demo	86	80	152	127
6.6 Management Support ^b	18	12	18	12
6.7 Op. Systems Dev	699	621	714	690
Sec. 8003 general reduction				
Total Budget Auth.^a	810	722	886	833
OCO-Related Other Defense Programs				
Defense Health Program	34	201	33	160
Grand Total	844	923	919	993

Sources: White House budget submission dated April 9, 2009, H.Rept. 111-105, H.Rept. 111-151, and S.Rept. 111-20.

Notes:

- a. Account vs. Budget Activity Total Obligational Authority numbers may not agree due to rounding.
- b. Includes funds for Developmental and Operational Test and Evaluation.

Department of Homeland Security²⁵

The Department of Homeland Security (DHS) has requested \$1.354 billion for R&D and related programs in FY2010, an 8% decrease from FY2009.²⁶ The total includes \$968 million for the Directorate of Science and Technology (S&T), \$366 million for the Domestic Nuclear Detection Office (DNDO), and \$20 million for Research, Development, Test, and Evaluation (RDT&E) in the U.S. Coast Guard. The House bill (H.R. 2892 as passed by the House) would provide an increase of \$50 million for DNDO, for a total of \$1.403 billion. The Senate bill (H.R. 2892 as passed by the Senate) would provide an increase of \$19 million for S&T, the requested amount for DNDO, and an increase of \$10 million for Coast Guard RDT&E, for a total of \$1.384 billion. For details, see **Table 7**.

The S&T Directorate is the primary DHS R&D organization. Headed by the Under Secretary for Science and Technology, it performs R&D in several laboratories of its own and funds R&D performed by the national laboratories, industry, and universities. The Administration has requested a total of \$968 million for the S&T Directorate for FY2010. This is 4% more than the FY2009 appropriation of \$933 million. In the Command, Control, and Interoperability Division, a proposed increase of \$15 million for next-generation cyber security R&D is largely offset by reductions in the division's other activities. A proposed increase of \$25 million for the Explosives Division includes \$10 million to develop technologies for high-throughput screening of air cargo and \$15 million to develop technologies for detection of improvised explosive devices in mass transit and at large events. A proposed reduction of \$31 million for the Infrastructure and Geophysical Division includes the elimination of funding for local and regional initiatives previously established or funded at congressional direction. The request for Laboratory Facilities includes \$36 million for the planned National Bio and Agro Defense Facility (NBAF), about the same as in FY2009. A proposed increase of \$16 million for the Transition program includes \$5 million for the Homeland Security Studies and Analysis Institute, formerly the Homeland Security Institute (HSI), which was funded as a separate item in FY2009. The House bill would provide \$15 million more than the request for chemical and biological basic research and would provide \$10 million in the Infrastructure and Geophysical Division for local and regional initiatives. The House bill would also eliminate the requested funding for NBAF construction and prohibit the obligation of any funds for that purpose until the Secretary of Homeland Security receives a non-DHS assessment of the risks of conducting R&D on foot-and-mouth disease on the U.S. mainland. The Senate bill would provide \$23 million more than the request in the Infrastructure and Geophysical Division for local and regional initiatives. It would provide the full requested funding for NBAF construction. The Senate bill would also rescind \$7.5 million appropriated in prior years but not yet obligated.

Among the issues facing Congress are the S&T Directorate's priorities and how they are set; its relationships with other federal R&D organizations both inside and outside DHS; its budgeting and financial management; the allocation of its R&D resources to national laboratories, industry, and universities; and plans over the next few years to establish new university centers of excellence and terminate or merge several existing ones. For more information, see CRS Report

²⁵ This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

²⁶ If the FY2009 baseline is taken to exclude the DNDO Systems Acquisition account, which funds little or no R&D, the department-wide request for R&D and related programs is a 3% increase.

RL34356, *The DHS Directorate of Science and Technology: Key Issues for Congress*, by Dana A. Shea and Daniel Morgan.

The start of NBAF construction in FY2011 will likely require significant increases in Laboratory Facilities funding over the next several years. It may also result in increased congressional oversight. For construction of NBAF and decommissioning of the Plum Island Animal Disease Center (PIADC), which NBAF will replace, DHS expects to need appropriations of \$687 million between FY2011 and FY2014. The estimated total cost of the NBAF project, excluding PIADC decommissioning and site-specific infrastructure and utility upgrades, increased from \$451 million in December 2006 to \$615 million in May 2009. Decommissioning PIADC is expected to cost \$190 million. In the Department of Homeland Security Appropriations Act, 2009 (P.L. 110-329, Div. D, Sec. 540) Congress authorized DHS to offset NBAF construction and PIADC decommissioning costs by selling Plum Island. Site-specific NBAF costs of \$110 million will be contributed in-kind by Kansas State University. For more information on NBAF, see CRS Report RL34160, *The National Bio- and Agro-Defense Facility: Issues for Congress*, by Dana A. Shea, Jim Monke, and Frank Gottron.

Statutory authority for the HSI expired in April 2009. Under its general authority to establish federally funded R&D centers, the S&T Directorate has replaced the HSI with a new Homeland Security Studies and Analysis Institute. It has also established a Homeland Security Systems Engineering and Development Institute. Both institutes are expected to be funded mostly on a cost-reimbursement basis by other S&T programs and other DHS and non-DHS agencies. The DHS congressional budget justification for FY2010 estimates that reimbursable obligations by the two institutes will total \$122 million in FY2009 and \$143 million in FY2010.

The Domestic Nuclear Detection Office (DNDO) is the primary DHS organization for combating the threat of nuclear attack. It is responsible for all DHS nuclear detection research, development, testing, evaluation, acquisition, and operational support. The Administration has requested a total of \$366 million for DNDO for FY2010. This is a 29% reduction from the FY2009 appropriation of \$514 million. The requests for Management and Administration and Research, Development, and Operations are approximately the same as in FY2009, but no funds are requested for Systems Acquisition, which received \$153 million in FY2009. According to the DHS congressional budget justification, new funds for Systems Acquisition are not needed in FY2010 because unobligated funds are available from previous fiscal years, “the initial three-year pilot project” of the Securing the Cities initiative has been completed, and secretarial certification of Advanced Spectroscopic Portal (ASP) technology has been delayed. A floor amendment to the House bill added \$50 million to the Research, Development, and Operations account for activities currently funded by Systems Acquisition, including \$40 million for Securing the Cities. The House bill would otherwise fund DNDO at the requested levels. The Senate bill would provide \$10 million in Systems Acquisition for Securing the Cities and \$2 million less than the request for Management and Administration. It would rescind \$8 million appropriated in prior years but not yet obligated. Otherwise, it would provide the requested amounts for DNDO.

Congressional attention has focused on the testing and analysis DNDO has conducted to support its decision to purchase and deploy ASPs, a type of next-generation radiation portal monitor. A requirement for secretarial certification before full-scale ASP procurement has been included in each appropriations act since FY2007. The expected date for certification has been postponed several times. For more information, see CRS Report RL34750, *The Advanced Spectroscopic Portal Program: Background and Issues for Congress*, by Dana A. Shea, John D. Moteff, and Daniel Morgan.

The global nuclear detection architecture overseen by DNDO and the relative roles of DNDO and the S&T Directorate in research, development, testing, and evaluation also remain issues of congressional interest. For more information on the global nuclear detection architecture, see CRS Report RL34574, *The Global Nuclear Detection Architecture: Issues for Congress*, by Dana A. Shea.

The mission of DNDO, as established by Congress in the SAFE Port Act (P.L. 109-347), includes serving as the primary federal entity “to further develop, acquire, and support the deployment of an enhanced domestic system” for detection of nuclear and radiological devices and material (6 U.S.C. 592). Congress may wish to consider whether the acquisition portion of that mission is consistent with the Administration’s request for no new funding for Systems Acquisition and the following statement in the President’s *Budget Appendix* (pp. 560-561):

In the past, DNDO acquired and deployed radiation detection technologies for DHS components, primarily the Coast Guard and the Customs and Border Patrol, or state and local users. Funding requests for radiation detection equipment will now be sought by the end users that will operate them.

Table 7. Department of Homeland Security R&D and Related Programs

(in millions of dollars)

	FY2008 Enacted	FY2009 Enacted	FY2010 Request	FY2010 House	FY2010 Senate
Directorate of Science and Technology	830	933	968	968	987
Management and Administration	139	132	142	142	143
R&D, Acquisition, and Operations	692	800	826	825	844
<i>Border and Maritime</i>	25	33	40	40	40
<i>Chemical and Biological</i>	208	200	207	222	207
<i>Command, Control, and Interoperability</i>	57	75	80	81	83
<i>Explosives</i>	78	96	121	121	121
<i>Human Factors / Behavioral Sciences</i>	14	12	15	17	12
<i>Infrastructure and Geophysical</i>	64	76	45	52	68
<i>Innovation</i>	33	33	44	44	44
<i>Laboratory Facilities</i>	104	162	154	123	155
<i>Test and Evaluation, Standards</i>	29	29	29	29	29
<i>Transition</i>	25	29	45	46	45
<i>University Programs</i>	49	50	46	50	48
<i>Homeland Security Institute</i>	5	5	0	0	0
<i>Rescission of Prior-Year Unobligated Balances</i>	—	—	—	—	(8)
Domestic Nuclear Detection Office	485	514	366	416	366
Management and Administration	32	38	40	40	38
Research, Development, and Operations	324	323	327	377	319
<i>Systems Engineering and Architecture</i>	22	25	25	25	25
<i>Systems Development</i>	118	108	100	100	100

	FY2008 Enacted	FY2009 Enacted	FY2010 Request	FY2010 House	FY2010 Senate
<i>Transformational R&D</i>	96	103	111	111	111
<i>Assessments</i>	38	32	32	32	32
<i>Operations Support</i>	34	38	38	38	38
<i>National Technical Nuclear Forensics Center</i>	15	17	20	20	20
<i>Radiation Portal Monitor Procurement</i>	0	0	0	10	0
<i>Securing the Cities</i>	0	0	0	40	0
<i>Rescission of Prior-Year Unobligated Balances</i>	—	—	—	—	(8)
Systems Acquisition	130	153	0	0	10
<i>Radiation Portal Monitoring Program</i>	90	120	0	0	0
<i>Securing the Cities</i>	30	20	0	0	10
<i>Human Portable Radiation Detection Systems</i>	10	13	0	0	0
U.S. Coast Guard RDT&E	25	18	20	20	30
TOTAL	1,340	1,465	1,354	1,403	1,384

Source: DHS FY2010 congressional budget justification, online at <http://www.dhs.gov/xabout/budget/>; H.R. 2892 as passed by the House; H.Rept. 111-157; H.R. 2892 as passed by the Senate; and S.Rept. 111-31.

Notes: Totals may not add because of rounding.

National Institutes of Health²⁷

President Obama's budget for FY2010 requests a modest increase for NIH, which will be supplemented by about \$5 billion dollars of stimulus funding remaining to be spent in FY2010. The budget requests a program level total of \$30.696 billion, a \$443 million increase (1.5%) over the FY2009 level of \$30.253 billion enacted in regular appropriations. The FY2009 funding was \$933 million (3.2%) above the comparable level of \$29.321 billion for FY2008 (see **Table 8**). In addition to the FY2009 regular appropriations, which were provided in Division F of the Omnibus Appropriations Act, 2009 (P.L. 111-8), NIH received emergency supplemental appropriations in Division A of the American Recovery and Reinvestment Act of 2009 (ARRA), also called the economic stimulus package or Recovery Act (P.L. 111-5). The Recovery Act provided a total of \$10.400 billion to NIH, roughly half of which was slated to be obligated in FY2009 and the remainder in FY2010.

NIH's funding comes primarily from the annual appropriations bill for the Departments of Labor, Health and Human Services, and Education, and Related Agencies (Labor/HHS), with an additional amount for Superfund-related activities from the appropriations bill for the Department of the Interior, Environment, and Related Agencies (Interior/Environment). Those two bills provide NIH's discretionary budget authority. In addition, NIH receives mandatory funding of \$150 million annually that is provided in the Public Health Service (PHS) Act for a special program on diabetes research, and also receives \$8.2 million annually for the National Library of Medicine from a transfer within PHS. Each year since FY2002, Congress has provided that a

²⁷ This section was written by Pamela Smith, Analyst in Biomedical Policy, CRS Domestic Social Policy Division.

portion of NIH's Labor/HHS appropriation be transferred to the Global Fund to Fight HIV/AIDS, Tuberculosis, and Malaria. The transfer, currently \$300 million, is part of the U.S. contribution to the Global Fund. The total funding available for NIH activities, taking account of add-ons and transfers, is called the program level. Because the "NIH program level" cited in the Administration's FY2010 budget documents does not reflect the Global Fund transfer, **Table 8** shows the program level both before and after the transfer. Discussions in this section refer to the program level after the transfer.

In congressional action on FY2010 appropriations bills, the House passed its Labor/HHS bill on July 24, 2009 (H.R. 3293, H.Rept. 111-220), and its Interior/Environment bill on June 26 (H.R. 2996, H.Rept. 111-180). The House bills would provide NIH with a program level total of \$31.196 billion, \$943 million (3.1%) more than the FY2009 level and \$500 million over the request. The Senate Appropriations Committee reported its version of H.R. 3293 on August 4, 2009 (S.Rept. 111-66); the Senate passed its version of H.R. 2996 on September 24, 2009 (S.Rept. 111-38). The Senate bills would provide a program level total of \$30.696 billion, the same amount as requested, but the distribution among NIH institutes varies somewhat from the request. In the absence of an enacted FY2010 appropriation, NIH has been operating since October 1, 2009, with temporary funding provided by a continuing appropriations resolution; spending is permitted at the FY2009 rate of operations.

Six years ago, in FY2003, NIH reached the peak of its purchasing power from regular appropriations when Congress completed a five-year doubling of the NIH budget. In each year since then, NIH's buying power has declined because its annual appropriations have grown at a lower rate than the inflation rate for medical research. Congress provided NIH with annual increases in the range of 14%-15% each year from FY1999 through FY2003. From FY2004 to FY2009, increases dropped to between 1.0% and 3.2% each year (except that the FY2006 total was a 0.3% decrease), at a time when, according to NIH, the biomedical research inflation rate ranged between 3.7% and 4.6% per year. The projected changes in the Biomedical Research and Development Price Index (BRDPI) are 3.8% for FY2009 and 3.3% for FY2010.²⁸ In inflation-adjusted terms (converting all amounts to constant 2009 dollars), the FY2009 funding level from the Omnibus Appropriations Act represented an estimated 12% decrease in purchasing power from the FY2003 peak, and the FY2010 request level is 13% below FY2003.

The agency's organization consists of the Office of the NIH Director and 27 institutes and centers. The Office of the Director (OD) sets overall policy for NIH and coordinates the programs and activities of all NIH components, particularly in areas of research that involve multiple institutes. The institutes and centers (collectively called ICs) focus on particular diseases, areas of human health and development, or aspects of research support. Each IC plans and manages its own research programs in coordination with the Office of the Director. As shown in **Table 8**, Congress provides a separate appropriation to 24 of the 27 ICs, to OD, and to a buildings and facilities account. (The other three centers, not included in the table, are funded through the NIH Management Fund.)

The FY2010 request proposes increases of 1.1% to 1.7% for most of the ICs. Traditionally, budget requests and enacted appropriations have treated the various institutes and centers

²⁸ National Institutes of Health, *Biomedical Research and Development Price Index: Fiscal Year 2008 Update and Projections for FY 2009-FY 2014*, Bethesda, MD, February 3, 2009. http://officeofbudget.od.nih.gov/UI/2009/BRDPI_Proj_Feb_2009_final.pdf.

approximately equally in percentage terms, maintaining their relative sizes over the years. That pattern is, however, subject to alteration because of special initiatives or new developments in scientific or public health needs. Some past examples have included the substantial ramping up of funds for ICs doing research on cancer, HIV/AIDS, bioterrorism, and genome sciences.

In the FY2010 request, the Administration proposed initiatives in cancer research and in research on autism spectrum disorders. Support of cancer research across NIH would increase by \$268 million (4.7%) to just over \$6 billion, representing the first year of a proposed eight-year plan to double funding for cancer research by FY2017. The budget of the National Cancer Institute would account for \$5,150 million of that amount, with a proposed increase of \$181 million (3.6%). The Administration also proposed an eight-year HHS initiative to invest an additional \$1 billion in autism-related activities. The FY2010 request for NIH includes \$141 million for the research portion of the proposed \$211 million HHS-wide initiative. The amount would be a \$19 million increase (15.6%) in NIH's estimated spending on autism. Another area receiving a substantial boost in the request, at 4.8% across NIH, is nanotechnology-related research. In particular, the small program in the National Institute of Environmental Health Sciences (NIEHS) on the human health impact of nanotechnology is proposed for a \$9 million (60.7%) increase to \$24 million, contributing to a 3.2% increase in the proposed total for NIEHS.

The House and Senate Appropriations Committees have rejected the proposals to set specific funding levels for particular diseases. They expressed concern over establishing a precedent of congressional funding decisions made outside of the peer review system, noting that the proposed increases for cancer and autism would absorb nearly two-thirds of the overall increase proposed for NIH. The House Labor/HHS bill recommends an overall increase of 3.1% for NIH, with most of the ICs receiving a 3.6% increase, in line with the biomedical research inflation rate. The Senate committee recommends the same overall increase of 1.5% as the request, but provides most of the ICs with 1.7% increases. The two committees agreed on giving proportionally larger increases to NIEHS and to the National Center for Research Resources (NCRR).

The appropriation for the Office of the Director covers a variety of cross-cutting programs in addition to funding for OD's own leadership and management operations. In the aggregate, funding in the FY2010 request for the Office of the Director drops by \$64 million (-5.1%) to \$1,183 million, but only because the NIH Director's Bridge Award program is not funded. The program received \$91 million in FY2009 to provide short-term awards to investigators whose renewal applications had just missed the funding cutoff; in FY2010, Recovery Act funds will be available for similar purposes. The other programs managed or coordinated by OD are all proposed for sustained or increased funding. The House and Senate committees have agreed with the OD request for the most part, except that the House provides less for the Common Fund (see below). The request includes \$194 million for the National Children's Study (NCS), to which the House has agreed. Both committees note that the cost projections for the NCS have increased substantially, and that NIH is extending its pilot phase, leading the Senate committee to defer specifying an amount for the study until conference. The request includes \$97 million for research on medical countermeasures against nuclear, radiological, and chemical threats (the House committee noted its agreement); \$5 million for a new program in bioethics research and training (the House funds the initiative through the ICs rather than in OD); \$5 million to expand ongoing trans-NIH stewardship and oversight activities; and a total of \$181 million (up 2.6%) for several program coordination offices that work with the ICs.

Also funded through the OD account is the NIH Common Fund, which supports NIH Roadmap initiatives and other trans-institute research. The NIH Roadmap for Medical Research is a set of

trans-NIH research activities designed to support high-risk/high-impact research in emerging areas of science or public health priorities. For FY2010, the President requests \$549 million for the Roadmap/Common Fund, up \$8 million (1.5%) from FY2009. The Senate committee bill agrees with that amount, while the House bill provides a lower amount of \$534 million. Some Roadmap programs that have been supported for five years are ready to transition to the ICs for continued support. The Common Fund is also supporting a number of initiatives with Recovery Act money (see further discussion below).

Of the funds appropriated to NIH each year, about 84% go out to the extramural research community in the form of grants, contracts, and other awards. The funding supports research performed by more than 300,000 scientists and technical personnel who work at more than 3,100 universities, hospitals, medical schools, and other research institutions around the country and abroad. The primary funding mechanism for support of the full range of investigator-initiated research is competitive, peer-reviewed research project grants (RPGs). Total funding for RPGs, at \$16.4 billion in the FY2010 request, represents about 53% of NIH's budget. The request proposes to support an estimated 38,042 awards, 171 more than projected to be supported with regular FY2009 appropriations. Within that total, 9,849 awards would be competing RPGs, 7 more than in FY2009. ("Competing" awards means new grants plus competing renewals of existing grants.) The House funding level would provide support for 38,888 total grants, an increase of 1,105 over FY2009, including 10,739 new and competing grants, an increase of 914. The request and the House bill would each provide inflation-adjustment increases of 2% for noncompeting continuation awards, as well as a 2.0% increase in the average cost of competing RPGs. Under the request, the expected "success rate" of applications receiving funding would be about 21%, the same as the estimated rate for FY2009. Estimated success rates for the various ICs would range from 12% to 50%, although most would range from 15% to 27%.

Several NIH efforts are focused on supporting new investigators to encourage young scientists to undertake careers in research and to help them speed their transition from training to independent research. The Pathway to Independence program provides, through all the ICs, mentored grants that convert to independent RPGs; the House committee specifies \$102 million for the program. The NIH Director's New Innovator Award program provides first-time independent awards to especially creative investigators; the Administration plans to spend \$80 million to support about 35 New Innovator Awards through the Common Fund in FY2010. In FY2009, NIH began giving special consideration during peer review to applications for research support made by Early Stage Investigators (new investigators who are within 10 years of having completed their terminal research degree or residency). For the National Research Service Awards, NIH's regular training mechanism, the request proposes an increase of \$8 million (1.0%) to \$798 million. The funding would support 17,742 Full-Time Training Positions, an increase of 101. Although NIH did not request any increases in stipends or other training-related expenses for pre- or post-doctoral fellows, the House bill provides funding for a 2% average increase in research training stipends.

Changes proposed in the request for other funding mechanisms within the NIH budget include increased support for research centers, up \$40 million (1.3%) to \$3.056 billion. That includes support of the Clinical and Translational Science Awards (CTSAs), funded at an estimated \$467 million, including \$25 million from the Common Fund. Support for grants in the Other Research category would increase by \$25 million (1.4%) to a total of \$1.844 billion. R&D contracts would increase by \$33 million (1.0%) to \$3.412 billion, including \$300 million for the Global HIV/AIDS Fund. A trans-NIH program launched in FY2009, the Therapeutic Rare and Neglected Diseases Initiative (TRNDI), would continue at \$24 million. The NIH intramural research program, representing about 10% of the NIH budget, would increase by \$48 million (1.5%) to a

total of \$3.219 billion. The request would provide an increase of \$25 million (1.8%) to a total of \$1.430 billion for research management and support. The request and the Senate committee recommendation would keep the intramural Buildings and Facilities account at \$126 million, while the House bill provides \$100 million. There will be additional spending for repairs and construction with the \$500 million that NIH received for the purpose in the Recovery Act. As has been the case for the past five years, no new funding is requested for extramural research facilities construction and renovation. The Recovery Act provided \$1.0 billion for this purpose, from which awards will continue to be made in FY2010.

NIH and three of the other Public Health Service agencies within HHS are subject to a budget tap called the PHS Program Evaluation Set-Aside. Section 241 of the PHS Act (42 U.S.C. § 238j) authorizes the Secretary to use a portion of eligible appropriations to assess the effectiveness of federal health programs and to identify ways to improve them. The tap has the effect of redistributing appropriated funds among PHS and other HHS agencies. The FY2009 appropriation kept the tap at 2.4%, the same as in FY2008. NIH, with the largest budget among the PHS agencies, becomes the largest “donor” of program evaluation funds, and is a relatively minor recipient. By convention, budget tables such as **Table 8** do not subtract the amount of the evaluation tap, or of other taps within HHS, from the agencies’ appropriations.²⁹

As mentioned earlier, in addition to the FY2009 regular appropriations, NIH received a total of \$10.400 billion in emergency FY2009 supplemental appropriations in the economic stimulus legislation, the American Recovery and Reinvestment Act of 2009 (P.L. 111-5). The funds were made available for obligation for two years. NIH’s current implementation plans indicate that more than \$5 billion will remain to be obligated in FY2010. The funding given to NIH included \$8.2 billion for extramural research; \$1.3 billion for non-federal research facility construction, renovation, and equipment; \$500 million for NIH buildings and facilities; and \$400 million for comparative effectiveness research.³⁰

Activities supported with NIH’s ARRA funding are being tracked on the NIH Recovery website.³¹ On a webpage about current grant funding opportunities, NIH says: “While NIH Institutes and Centers have broad flexibility to invest in many types of grant programs, they will follow the spirit of the ARRA by funding projects that will stimulate the economy, create or retain jobs, and have the potential for making scientific progress in 2 years.”³² The agency’s implementation plans for the various funding categories are available on the HHS Recovery Plans website.³³ NIH is focusing activities on (1) funding new and recently peer reviewed, highly meritorious research grant applications that can be accomplished in two years or less; (2) giving targeted supplemental awards to current grants to push research forward; and (3) supporting a new initiative called the NIH Challenge Grants in Health and Science Research (at least \$200 million to fund 200 or more grants with budgets under \$500,000 per year) for research on specific topics that would benefit

²⁹ For further information on the Evaluation Set-Aside, see CRS Report RL34098, *Public Health Service (PHS) Agencies: Background and Funding*, coordinated by Pamela W. Smith.

³⁰ For further details, see CRS Report R40181, *Selected Health Funding in the American Recovery and Reinvestment Act of 2009*, coordinated by C. Stephen Redhead.

³¹ *NIH and the ARRA*, <http://www.nih.gov/recovery/>.

³² *Grant Funding Opportunities Supported by the American Recovery & Reinvestment Act of 2009 (ARRA)*, <http://grants.nih.gov/recovery/>. The site also includes searchable state-by-state data on ARRA-funded awards.

³³ *Department of Health and Human Services Agency-Wide Plan*, <http://www.hhs.gov/recovery/reports/plans/index.html>. See the section on “Strengthening Scientific Research and Facilities.”

from significant two-year jumpstart funds. NIH received about 20,000 applications in response to the Challenge Grant announcement. Another new program called Research and Research Infrastructure “Grand Opportunities” (GO) grants will devote about \$200 million to supporting large-scale research projects (budgets over \$500,000 per year) working in critical areas, cutting-edge technologies, and new approaches to multi- and interdisciplinary research teams. On September 30, 2009, President Obama announced that NIH had awarded \$5 billion in ARRA funding, supporting over 12,000 grants to research institutions in every state. A White House press release highlighted examples of research in cancer, heart disease, and autism, particularly over \$1 billion in research applying the technology produced by the Human Genome Project.³⁴

Table 8. National Institutes of Health
(in millions of dollars)

Institutes and Centers (ICs)	FY2008 Actual^a	FY2009 Enacted	FY2009 ARRA	FY2010 Request	FY2010 House	FY2010 Sen. Cte.
Cancer (NCI)	4,831	4,969	1,257	5,150	5,150	5,054
Heart, Lung, and Blood (NHLBI)	2,938	3,016	763	3,050	3,123	3,067
Dental and Craniofacial Research (NIDCR)	392	403	102	408	417	409
Diabetes, Digestive, and Kidney Diseases (NIDDK)	1,716	1,761	445	1,781	1,824	1,791
Neurological Disorders and Stroke (NINDS)	1,552	1,593	403	1,613	1,650	1,620
Allergy and Infectious Diseases (NIAID) ^b	4,583	4,703	1,113	4,760	4,860	4,777
General Medical Sciences (NIGMS)	1,946	1,998	505	2,024	2,069	2,032
Child Health and Human Development (NICHD)	1,261	1,295	327	1,314	1,341	1,317
Eye (NEI)	671	688	174	696	713	700
Environmental Health Sciences (NIEHS)	646	663	168	684	695	683
Aging (NIA)	1,053	1,081	273	1,093	1,119	1,099
Arthritis, Musculoskeletal, and Skin Diseases (NIAMS)	511	525	133	531	544	534
Deafness and Communication Disorders (NIDCD)	396	407	103	413	422	415
Nursing Research (NINR)	138	142	36	144	147	144
Alcohol Abuse and Alcoholism (NIAAA)	439	450	114	455	466	458

³⁴ See the press release, “President Obama Announces Recovery Act Funding for Groundbreaking Medical Research,” and an accompanying fact sheet, at http://www.whitehouse.gov/the_press_office/President-Obama-Announces-Recovery-Act-Funding-For-GroundingBreaking-Medical-Research/ and http://www.whitehouse.gov/the_press_office/Fact-Sheet-Recovery-to-Discovery-5-Billion-Recovery-Act-Investment-in-Scientific-Research-and-Jobs/.

Institutes and Centers (ICs)	FY2008 Actual ^a	FY2009 Enacted	FY2009 ARRA	FY2010 Request	FY2010 House	FY2010 Sen. Cte.
Drug Abuse (NIDA)	1,006	1,033	261	1,045	1,070	1,050
Mental Health (NIMH) ^c	1,413	1,450	367	1,475	1,502	1,475
Human Genome Research (NHGRI)	489	502	127	510	520	511
Biomedical Imaging and Bioengineering (NIBIB)	300	308	78	313	319	313
Research Resources (NCRR)	1,156	1,226	1,610	1,252	1,280	1,257
Complementary and Alternative Medicine (NCCAM)	122	125	32	127	130	128
Minority Health and Health Disparities (NCMHD)	201	206	52	209	213	210
Fogarty International Center (FIC)	67	69	17	69	71	69
National Library of Medicine (NLM)	322	331	84	334	343	336
Office of Director (OD)	1,112	1,247	1,337	1,183	1,169	1,183
Common Fund (non-add)	(498)	(541)	(137)	(549)	(534)	(549)
Buildings & Facilities (B&F)	119	126	500	126	100	126
Subtotal, Labor/HHS Appropriation	29,380	30,317	10,381	30,759	31,259	30,759
Superfund (Interior appropriation to NIEHS) ^d	78	78	19	79	79	79
Total, NIH discretionary budget authority	29,457	30,395	10,400	30,838	31,338	30,838
Pre-appropriated Type I diabetes funds ^e	150	150	0	150	150	150
PHS Evaluation Tap funding ^f	8	8	0	8	8	8
NIH program level before Global Fund transfer (cited in budget documents)	29,615	30,553	10,400	30,996	31,496	30,996
Global Fund transfer (AIDS/TB/Malaria) ^b	-295	-300	0	-300	-300	-300
Total, NIH program level after Global Fund transfer	29,321	30,253	10,400	30,696	31,196	30,696

Source: Adapted by CRS from NIH, *Justification of Estimates for Appropriations Committees, Fiscal Year 2010*, Tabular Data, p. TD-1, at <http://officeofbudget.od.nih.gov/ui/2010/Tabular%20Data.pdf>; and H.Rept. 111-220 and S.Rept. 111-66 on H.R. 3293. Details may not add to totals due to rounding.

Notes:

- FY2008 appropriations were provided in the Consolidated Appropriations Act, 2008 (P.L. 110-161, Division G, enacted December 26, 2007), with an additional \$150 million from the Supplemental Appropriations Act, 2008 (P.L. 110-252, June 30, 2008). Reflects transfers among ICs.
- NIAID totals include funds for transfer to the Global Fund to Fight HIV/AIDS, TB, and Malaria.

- c. FY2008 NIMH includes \$0.983 million transferred from Office of the Secretary to administer the Interagency Autism Coordinating Committee. FY2009 does not yet reflect a similar transfer of \$1 million.
- d. Separate account in the Interior/Environment appropriations for NIEHS research activities related to Superfund.
- e. Funds available to NIDDK for diabetes research under PHS Act § 330B (authorized by P.L. 106-554, P.L. 107-360, P.L. 110-173, and P.L. 110-275).
- f. Additional funds for NLM from PHS Evaluation Set-Aside (§ 241 of PHS Act).

Department of Energy³⁵

The Administration has requested \$11.464 billion for Department of Energy (DOE) R&D and related programs in FY2010, including activities in three major categories: science, national security, and energy. This request is 3% above the FY2009 regular appropriation of \$11.131 billion. (In addition, DOE received \$10.900 billion for R&D and related programs in the Recovery Act.) The House provided a total of \$11.355 billion. The Senate provided a total of \$11.379 billion. See **Table 9** for details.

The request for the DOE Office of Science is \$4.942 billion, an increase of 3.9% from the FY2009 regular appropriation of \$4.758 billion. (The Office of Science also received \$1.600 billion in the Recovery Act.) The Administration intends to double the combined R&D funding of the Office of Science and two other agencies over the decade from FY2006 to FY2016.³⁶ This policy continues a goal established by the Bush Administration as part of its American Competitiveness Initiative. The 3.9% increase requested for FY2010 is less than the annual growth rate required to achieve a doubling in ten years, but that comparison is complicated by the planned expenditure of Recovery Act funds in both FY2009 and FY2010. The America COMPETES Act (P.L. 110-69) authorizes \$5.814 billion for the Office of Science in FY2010. The House provided \$4.944 billion. The Senate provided \$4.899 billion.

Within the Office of Science, the request for basic energy sciences includes \$68 million for the establishment of two energy innovation hubs, one focused on materials for energy storage, and the other on direct production of fuels from solar energy.³⁷ The House funded one hub; the Senate funded both. A proposed 10.8% increase for advanced scientific computing research would support additional design research on computer architectures for science and infrastructure improvements for the Leadership Computing Facility at Argonne National Laboratory. The House provided the requested amount for advanced scientific computing; the Senate provided \$10 million less. In fusion energy sciences, an increase of \$11 million is requested for the U.S. share of the International Thermonuclear Experimental Reactor (ITER). Press reports continue to raise concerns about cost increases and schedule delays for ITER.³⁸ A revised official estimate of cost

³⁵ This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

³⁶ See Executive Office of the President, Office of Science and Technology Policy, *The President's Plan for Science and Innovation: Doubling Funding for Key Basic Research Agencies*, May 7, 2009, <http://www.ostp.gov/galleries/budget/doubling.pdf>.

³⁷ DOE is proposing to initiate eight energy innovation hubs in FY2010. Their aim is to support cross-disciplinary energy R&D that addresses challenges in basic science, technology, economics, and policy. The House funded one hub; the Senate funded five.

³⁸ See, for example, Ian Sample, "ITER: Flagship Fusion Reactor Could Cost Twice as Much as Budgeted," *The Guardian*, January 29, 2009, <http://www.guardian.co.uk/science/2009/jan/29/nuclear-fusion-power-iter-funding>; and (continued...)

and schedule is expected in late FY2010 or FY2011. The House provided the requested amount for fusion, plus \$20 million for laser fusion research at the Naval Research Laboratory; the Senate provided \$416 million.

The request for the Advanced Research Projects Agency–Energy (ARPA-E) is \$10 million, down from the regular FY2009 appropriation of \$15 million. This is a new program authorized by the America COMPETES Act. DOE budget documents describe its mission as overcoming long-term, high-risk technological barriers to the development of energy technologies. The bulk of the agency’s funding to date is the \$400 million it received in the Recovery Act.³⁹ Neither the House nor the Senate provided FY2010 funding for ARPA-E. The House committee report explained that this was because Recovery Act funds remain available, and “the decision not to provide any additional funding ... does not in any way suggest a lack of commitment to this program by the Committee.”

The request for DOE national security R&D is \$3.300 billion, a 2.9% increase from \$3.206 billion in FY2009. A proposed increase of \$175 million for the naval reactors program includes \$59 million more for R&D on reactor and power plant technology, as DOE and the Navy initiate development of a successor to the Ohio-class ballistic missile submarine, and \$48 million more for refueling, overhaul, and modernization of a prototype reactor plant in upstate New York. A proposed decrease of \$66 million for nonproliferation and verification R&D would mostly result from a shift of funding to other DOE nonproliferation activities. The request includes no funds for the reliable replacement warhead program. The House provided a total of \$3.307 billion, including \$25 million more than the request for inertial confinement fusion. The Senate provided \$3.408 billion, including \$40 million more than the request for increased development of nuclear detection technologies and \$16.5 million more for inertial confinement fusion.

The request for DOE energy R&D is \$3.212 billion, up 1.9% from \$3.152 billion in FY2009. Within this total, R&D on energy efficiency, renewable energy, and the electric power grid would increase, while fossil fuel and nuclear energy R&D would decrease. Increases for energy efficiency and renewable energy R&D include \$145 million more for solar energy, including \$35 million for a new solar electricity innovation hub; \$60 million more for vehicle energy efficiency; \$98 million more for building energy efficiency, including \$35 million for a new innovation hub on energy efficient building systems; and \$115 million for RE-ENERGYSE, a new program for education and workforce development in energy science and engineering; these increases would be partly offset by a \$100 million decrease for fuel cell technology. The request would more than double funding for the electricity delivery and energy reliability R&D program, which is being restructured to reflect the Administration’s goals for grid modernization; \$35 million of the proposed increase would fund a new energy innovation hub on grid materials, devices, and systems. A proposed 30% reduction for fossil energy R&D results from no new funding being requested for the Clean Coal Power Initiative; the department’s budget documents note that this initiative is “already strongly supported” by the \$800 million it received under the Recovery Act.

(...continued)

Geoff Brumfiel, “Fusion Dreams Delayed,” *Nature*, May 28, 2009, <http://www.nature.com/news/2009/090527/pdf/459488a.pdf>.

³⁹ For more information on ARPA-E, see CRS Report RL34497, *Advanced Research Projects Agency - Energy (ARPA-E): Background, Status, and Selected Issues for Congress*, by Deborah D. Stine. In the regular FY2009 appropriation, ARPA-E was funded in the Science account, which otherwise funds only the Office of Science. In FY2010 budget documents, ARPA-E funding in the Recovery Act and requested ARPA-E funding for FY2010 appear in a separate Energy Transformation Acceleration Fund account.

This decrease would be partly offset by the \$35 million proposed for a new innovation hub on carbon capture and storage. Within nuclear energy R&D, a proposed reduction of \$158 million for Nuclear Power 2010, which is to be concluded in FY2010, is partly offset by a request for \$70 million to establish two new energy innovation hubs, one on modeling and simulation and one on extreme materials. The House provided \$3.104 billion for energy R&D. Relative to the request, this total included increases of \$70 million for nuclear energy, \$45 million for vehicle energy efficiency, \$45 for fuel cell technology, and \$10 million for water power; decreases of \$61 million for solar energy, \$27 million for building energy efficiency, and \$69 million for program direction and support; and no funding for RE-ENERGYSE. The House provided \$3.072 billion. Relative to the request, this total included increases of \$82 million for fossil energy, \$10 million for nuclear energy; a decrease of \$35 million for smart grid R&D; and a net decrease of \$197 million for energy efficiency and renewable energy. The Senate's net decrease for energy efficiency and renewable energy included increases for hydrogen, wind, and water power, decreases in fuel cell technology, solar energy, and program direction and support, and no funding for RE-ENERGYSE.

Table 9. Department of Energy R&D and Related Programs
(\$ in millions)

	FY2008	FY2009 Regular	FY2009 ARRA	FY2010 Request	FY2010 House	FY2010 Senate
Science	4,083	4,773	2,000	4,952	4,944	4,899
Office of Science	4,083	4,758	1,600	4,942	4,944	4,899
– Basic Energy Sciences	1,253	1,572	555	1,686	1,675	1,654
– High Energy Physics	703	796	232	819	819	813
– Biological and Environmental Research	531	602	166	604	597	604
– Nuclear Physics	424	512	155	552	536	540
– Fusion Energy Sciences	295	403	91	421	441	416
– Advanced Scientific Computing Research	342	369	157	409	409	399
– Other	535	504	244	451	467	473
Advanced Research Projects Agency – Energy	0	15	400	10	0	0
National Security	3,180	3,206	0	3,300	3,307	3,408
Weapons Activities ^a	2,005	1,982	0	1,945	1,972	2,042
Naval Reactors	775	828	0	1,003	1,003	973
Nonproliferation and Verification R&D	380	364	0	297	297	337
Def. Env'tal. Cleanup Technology Devel.	21	32	0	55	35	55
Energy	2,668	3,152	8,900	3,212	3,104	3,072
Energy Efficiency and Renewable Energy ^b	1,423	1,676	5,500	2,018	1,847	1,821
Fossil Energy R&D	727	876	3,400	618	618	699

	FY2008	FY2009 Regular	FY2009 ARRA	FY2010 Request	FY2010 House	FY2010 Senate
Nuclear Energy R&D ^c	435	515	0	403	473	413
Electr. Delivery & Energy Reliability R&D	83	85	0	174	166	139
Total	9,931	11,131	10,900	11,464	11,355	11,379

Source: DOE FY2010 congressional budget justification, online at <http://www.cfo.doe.gov/budget/10budget/Start.htm>; H.R. 3183 as passed by the House and H.Rept. 111-203; and H.R. 3183 as passed by the Senate and S.Rept. 111-45.

Notes: A significant portion of the fossil energy funding in the ARRA is likely to be allocated to demonstration activities that not all observers would consider R&D.

- a. Includes Stockpile Services R&D Support, Stockpile Services R&D Certification and Safety, Science Campaigns, Engineering Campaigns except Enhanced Surety and Enhanced Surveillance, Inertial Confinement Fusion, Advanced Simulation and Computing, and a prorated share of Readiness in Technical Base and Facilities. Additional R&D activities may take place in the subprograms of Directed Stockpile Work that are devoted to specific weapon systems, but these funds are not included in the table because detailed funding schedules for those subprograms are classified.
- b. Excludes Weatherization and Intergovernmental Activities.
- c. Includes Advanced Fuel Cycle Initiative in FY2008 (in the Fuel Cycle Research and Facilities line item) as well as in FY2009 and FY2010 (in the Research and Development line item).

National Science Foundation⁴⁰

The FY2010 request for the National Science Foundation (NSF) is \$7.045 billion, an 8.5% increase (\$554.6 million) over the FY2009 estimate of \$6.490 billion (see **Table 10**). Under President Obama's Plan for Science and Innovation,⁴¹ the Administration has proposed doubling the federal investment in three basic research agencies (NSF, DOE Office of Science, and NIST) over a period of 10 years relative to the FY2006 level. The FY2010 request is intended as an installment toward that doubling effort and is structured to build on the scientific investments funded by the 2009 Omnibus Appropriations Act and the American Recovery and Reinvestment Act of 2009 (ARRA). The Administration anticipates that the largest increases in the Plan will occur in FY2012.

NSF identified several strategies in the FY2010 budget request, including expanding the scientific workforce and broadening participation from underrepresented groups and geographical regions; increasing three-fold the number of new Graduate Research Fellowships awarded annually; expanding and enhancing international partnerships and interagency collaborations; performing effectively with the highest standards of accountability; and maintaining a portfolio of basic, high-risk, and transformative research across all disciplines. The NSF Director describes transformative research as "a range of endeavors, which promise extraordinary outcomes; such as, revolutionizing entire disciplines, creating entirely new fields, or disrupting accepted theories

⁴⁰ This section was written by Christine M. Matthews, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

⁴¹ "The President's Plan for Science and Innovation," Office of Science and Technology Policy, The White House, May 7, 2009, <http://www.ostp.gov/galleries/budget/doubling.pdf>.

and perspective.”⁴² Several reports have recommended that funds be allocated specifically for this type of research. NSF contends that in the global environment of science and engineering, support for transformative, high-risk, high-reward research is critical to U.S. competitiveness. The FY2010 strategies parallel some of the goals contained in the Plan for Science and Innovation and are designed to promote research that will drive innovation; support the design and development of world-class facilities, instrumentation, and infrastructure; and maintain an internationally competitive workforce.

Included in the FY2010 request is \$5.733 billion for Research and Related Activities (R&RA), a 10.6% increase (\$550.1 million) above the FY2009 estimate of \$5.183 billion. R&RA funds research projects, research facilities, and education and training activities. Some in the scientific and academic communities have voiced concerns about the imbalance between support for the life sciences and the physical sciences. Research can be multidisciplinary and transformational, and often discoveries in the physical sciences lead to advances in other disciplines. The America COMPETES Act authorized increased federal research support in the physical sciences, mathematics, and engineering. The FY2010 request would provide \$1.380 billion for the Mathematical and Physical Sciences (MPS) Directorate, a 9.9% increase over the FY2009 level. The MPS portfolio supports investments in fundamental research, facilities, and instruments, and provides approximately 43% of the federal funding for basic research in mathematics and physical sciences conducted at colleges and universities. R&RA includes Integrative Activities (IA), a cross-disciplinary research and education program that is also a source of funding for the acquisition and development of research instrumentation at institutions. The FY2010 request provides \$271.1 million for IA. The IA also funds Partnerships for Innovation, disaster research teams, and the Science and Technology Policy Institute. In FY2008, support for the Experimental Program to Stimulate Competitive Research (EPSCoR) was transferred from the Education and Human Resources Directorate (EHR) to IA. NSF’s FY2010 request for EPSCoR is \$147.1 million, which is a part of the total IA funding request. The FY2010 request would support a portfolio of three complementary strategies—research infrastructure, co-funding, and outreach—for the 27 EPSCoR jurisdictions. Approximately half of the funding for EPSCoR would be used for a combination of new awards and research infrastructure improvement grants. The remaining half of the funding would support grants made in previous years.

The NSF asserts that international research partnerships are critical to the nation in maintaining a competitive edge, addressing global issues, and capitalizing on global economic opportunities. In FY2010, the Administration has requested \$49.0 million for the Office of International Science and Engineering (OISE), an 11.3% increase over FY2009. The OISE manages NSF’s offices in Beijing, Paris, and Tokyo that analyze and report on in-country and regional science and technology policies and developments. The OISE serves as a liaison with research institutes and foreign agencies, and facilitates coordination and implementation of NSF research and education efforts.

The Office of Polar Programs (OPP) is funded in the R&RA. The OPP is the primary source of U.S. support for basic research in polar regions. The NSF also serves in a leadership capacity for several international research partnerships in the Arctic and Antarctic. Research in the Arctic and Antarctic explores the various aspects of the global earth system that affect the global

⁴² Bement, Jr., Arden L., Director, National Science Foundation, “Transformative Research: The Artistry and Alchemy of the 21st Century,” remarks, Texas Academy of Medicine, Engineering and Science Fourth Annual Conference, Austin, Texas, January 4, 2007. http://www.nsf.gov/news/speeches/bement/07/alb070104_texas.jsp.

environment and climate. The FY2010 request for polar research is \$516.0 million, a 9.6% increase over the FY2009 estimate. Increases in OPP in FY2010 are for arctic and antarctic sciences—glacial and sea ice, terrestrial and marine ecosystems, the ocean and the atmosphere, and biology of life in the cold and dark. Priorities of the OPP in FY2010 include support for national energy goals, support for transformative research, and resupply improvements at the research stations. From FY2006 through FY2008, NSF had the responsibility for funding the operational costs of the U.S. Coast Guard's (USCG) three icebreakers that support scientific research in the polar regions—Polar Sea, Polar Star, and Healy.⁴³ NSF was responsible for the operation, maintenance, and staffing of the vessels under a Memorandum of Agreement (MOA) between NSF and USCG. Beginning in FY2009, the MOA no longer covers the Polar Star. The Polar Star will be refurbished by the USCG using FY2009 funds. The NSF will continue to operate and maintain the Polar Sea and Healy to conduct scientific research.

NSF supports several interagency R&D priorities in the FY2010 request. It is a lead supporter in the U.S. National Nanotechnology Initiative (NNI), requesting \$423.0 million for nanotechnology research. Funding would support research in emerging areas of nanoscale science and technology such as new drug delivery systems, advanced materials, and more powerful computer chips. This funding includes \$29.9 million for research to explore potential environmental, health, and safety affects of nanotechnology. NSF's other interagency priorities include funding for the Climate Change Science Program (\$299.9 million), Homeland Security (\$385.5 million), and Networking and Information Technology R&D (\$1.111 billion).

The NSF supports a variety of centers and center programs. The FY2010 request provides \$57.8 million for Science and Technology Centers, \$53.6 million for Materials Research Science and Engineering Centers, \$66.0 million for Engineering Research Centers, \$45.2 million for Nanoscale Science and Engineering Centers, \$25.8 million for Science of Learning Centers, \$24.0 million for Centers for Chemical Innovation, and \$17.4 million for Centers for Analysis and Synthesis.

The FY2010 request for the EHR Directorate is \$857.8 million, \$12.5 million (1.5%) above the FY2009 estimate. The EHR portfolio is focused on, among other things, increasing the technological literacy of all citizens; preparing the next generation of science, engineering, and mathematics professionals; and closing the achievement gap of underrepresented groups in all scientific fields. Support at the various educational levels in the FY2010 request is as follows: research on learning in formal and informal settings (including precollege), \$229.5 million; undergraduate education, \$289.9 million; and graduate education, \$181.4 million.

Priorities at the precollege level include research and evaluation on education in science and engineering (\$43.0 million), informal science education (\$66.0 million), project and program evaluation (\$12.0 million), and Discovery Research K-12 (\$108.5 million). Discovery Research is structured to combine the strengths of three existing programs and encourage innovative thinking in K-12 science, technology, engineering, and mathematics education.

According to NSF, its undergraduate level programs are designed to “create leverage for institutional change.” Priorities at the undergraduate level include the Robert Noyce Scholarship Program (\$55.0 million); Curriculum, Laboratory and Instructional Development (\$87.0 million);

⁴³ For expanded discussion of the icebreakers see for example CRS Report RL34391, *Coast Guard Polar Icebreaker Modernization: Background, Issues, and Options for Congress*, by Ronald O'Rourke.

STEM Talent Expansion Program (\$31.5 million); and Advanced Technological Education (\$64.0 million). The Math and Science Partnership Program (MSP), an interagency program, is proposed at \$58.2 million in the FY2010 request. The NSF coordinates its MSP activities with the Department of Education and state-funded MSP sites. At the graduate level, NSF's priorities are Integrative Graduate Education and Research Traineeship (\$29.9 million), Graduate Research Fellowships (\$102.6 million), and the Graduate Teaching Fellows in K-12 Education (\$49.0 million).

Additional EHR priorities support a portfolio of programs directed at strengthening and expanding the participation of underrepresented groups and diverse institutions in the scientific and engineering enterprise. Among the targeted programs in the FY2010 request are the Historically Black Colleges and Universities Undergraduate Program (\$32.0 million), Louis Stokes Alliances for Minority Participation (\$44.8 million), and Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers (\$1.5 million).

The Major Research Equipment and Facilities Construction (MREFC) account is funded at \$117.3 million in the FY2010 request, a decrease of 22.8% from the FY2009 estimate. The MREFC supports the acquisition and construction of major research facilities and equipment that extend the boundaries of science, engineering, and technology. According to NSF, it is the primary federal agency providing support for "forefront instrumentation and facilities for the academic research and education communities." NSF's first priority for funding is support for ongoing projects. Second priority is given to projects that have been approved by the National Science Board for new starts. To qualify for support, NSF required MREFC projects to have "the potential to shift the paradigm in scientific understanding and/or infrastructure technology." The FY2010 request is indicative of NSF's tighter standards and requirements for receiving funding in this account. The FY2010 request includes support for five ongoing projects: Advanced Laser Interferometer Gravitational Wave Observatory (\$46.3 million), Atacama Large Millimeter Array (\$42.8 million), IceCube Neutrino Observatory (\$1.0 million), Advanced Technology Solar Telescope (\$10.0 million), and the Ocean Observatories Initiative (\$14.3 million).

On February 17, 2009, President Obama signed into law P.L. 111-5, the American Recovery and Reinvestment Act, 2009 (ARRA). The law increased NSF's FY2009 funding by approximately \$3.0 billion. The NSF directed funding from ARRA to the following priorities:⁴⁴

- Support highly rated proposals that would otherwise be declined;
- Encourage high-risk, transformative research with the potential to grow the nation's economy;
- Create and sustain research jobs through new awards, graduate research fellows, and early-career researchers;
- Train and develop the careers of STEM undergraduates, teachers, and professional;
- Strengthen the nation's overall cyberinfrastructure and enhance institutional broadband access connectivity; and
- Meet facilities and infrastructure needs, including deferred maintenance.

⁴⁴ "FY2010 NSF Budget Request to Congress," National Science Foundation, p. Overview-7.

On May 27, 2009, the NSF announced its first major award made with funding from ARRA—for construction of the Alaska Region Research Vessel (\$148.0 million). This vessel has been designed to operate as both an ice-breaker and a research ship. This dual-purpose vessel has the ability to carry as many as 500 people and to stay at sea for as many as 300 days a year. The vessel has an operational life span of 30 years. NSF states that “The three-year construction phase of the project will support 4,350 total jobs, 750 directly at the shipyard and as many as 3,600 in the broader economy.”⁴⁵ The award announcement noted that NSF intends to ensure that the vessel will be built in a U.S. shipyard.

On June 18, 2009, the House Committee on Appropriations passed H.R. 2847, the Commerce, Justice, Science, and Related Agencies Appropriations Bill, 2010 (H.Rept. 111-149). The bill would provide a total of \$6.937 billion for the NSF in FY2010, \$108.5 million below the request and \$446.1 million above the FY2009 estimate. Included in the total for FY2010 is \$5.642 billion for R&RA, \$114.3 million for MREFC, and \$862.9 million for the EHR. The Senate reported the bill on June 25, 2009 (S.Rept. 111-34). The Senate-reported measure would provide \$6.917 billion for the NSF, \$19.7 million below the House-passed bill, \$128.2 million below the Administration’s request, and \$426.4 above the FY2009 estimate. The Senate-reported bill would provide \$5.618 billion for R&RA, \$122.3 million for the MREFC, and \$857.8 million for the EHR.

Table 10. National Science Foundation

(in millions of dollars)

	FY2008 Level	FY2009 Estimate	FY2009 ARRA	FY2010 Request	FY2010 House	FY2010 Sen. Cte.
Biological Sciences	\$615.6	\$655.8		\$733.0		
Computer & Inform. Sci. & Eng.	535.3	573.7		633.0		
Engineering	649.5	693.3		764.5		
Geosciences	757.9	807.1		909.0		
Math and Physical Sciences	1,171.1	1,256.0		1,380.0		
Social, Behav., & Econ. Sciences	227.9	240.3		257.0		
Office of Cyberinfrastructure	185.2	199.3		219.0		
Office of International Sci. & Eng.	47.8	44.0		49.0		
U.S. Polar Programs	447.1	470.7		516.0		
Integrative Activities	214.5	241.3		271.1		
U.S. Arctic Research Comm.	1.5	1.5		1.6		
Subtotal Res. & Rel. Act	4,853.3	5,183.1	2,500.0	5,733.2	5,642.1^c	5,618.0^d
Education & Human Resources	766.3	845.3	100.0	857.8	862.9	857.8
Major Res. Equip. & Facil. Constr.	166.9	152.0	400.0	117.3	114.3	122.3
Agency Operations & Award Management	282.0	294.0		318.4	299.9	300.4

⁴⁵ National Science Foundation, “NSF Announces First Major Award Under American Recovery and Reinvestment Act to the Alaska Region Research Vessel (ARRV),” press release, May 27, 2009, http://www.nsf.gov/news/news_summ.jsp?cntn_id=114796.

	FY2008 Level	FY2009 Estimate	FY2009 ARRA	FY2010 Request	FY2010 House	FY2010 Sen. Cte.
National Science Board	3.8	4.0		4.3	4.3	4.3
Office of Inspector General	11.8	12.0	2.0	14.0	13.0	14.0
Total NSF^b	6,084.0^a	6,490.4^b	3,002.0	7,045.0	6,936.5	6,916.8

Source: FY2010 Budget Request to Congress, National Science Foundation, Arlington, VA, May 7, 2009.

Notes:

- a. The Supplemental Appropriations Act, 2008 (P.L. 110-252) provided NSF with \$62.5 million in additional FY2008 funding. The FY2008 supplemental funding was not incorporated into the above table column.
- b. The totals do not include carryovers or retirement accruals. Totals may not add due to rounding.
- c. H.R. 2847, H.Rept. 111-149. Funding levels for specific directorates and programs and activities in R&RA are not yet available.
- d. H.R. 2847, S.Rept. 111-34.

Department of Commerce

National Institute of Standards and Technology⁴⁶

The National Institute of Standards and Technology (NIST) is a laboratory of the Department of Commerce with a mandate to increase the competitiveness of U.S. companies through appropriate support for industrial development of precompetitive, generic technologies and the diffusion of government-developed technological advances to users in all segments of the American economy. NIST research also provides the measurement, calibration, and quality assurance techniques that underpin U.S. commerce, technological progress, improved product reliability, manufacturing processes, and public safety.

The President's FY2010 budget requests \$846.1 million in funding for NIST, an increase of 3.3% over the FY2009 appropriation. Support for in-house research and development under the Scientific and Technical Research and Services (STRS) account (including the Baldrige National Quality Program) is to increase 13.3% to \$534.6 million. The Manufacturing Extension Program (MEP) would receive \$124.7 million, 13.4% more than the current fiscal year while financing for the Technology Innovation Program (TIP) is budgeted at \$69.9 million, an increase of 7.5% over FY2009. Construction funding would decline 32.0% to \$116.9 million. (See **Table 11.**)

The FY2010 Commerce, Justice, Science, and Related Agencies appropriations bill, H.R. 2847, as passed by the House, would provide \$781.1 million for NIST, 4.6% below FY2009 funding (due primarily to decreased funding for construction) and 7.7% less than the Administration's request. Included in this figure is \$510.0 million for the STRS account, which is 8.1% more than the current fiscal year, but 4.6% below the budget request. As in the President's budget, the \$124.7 million in support for MEP represents a 13.4% increase while funding for TIP would

⁴⁶ This section was written by Wendy H. Schacht, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

increase 7.5% to \$69.9 million. Construction spending would amount to \$76.5 million, a 55.5% decrease from FY2009 and 7.7% below what the Administration has requested.

The version of H.R. 2847, reported from the Senate Committee on Appropriations, would fund NIST at \$878.8 million, 7.3% above the current fiscal year, 3.7% above the President's budget request, and 12.5% more than the House-passed bill. Support for in-house R&D under the STRS account would total \$520.3 million, an increase of 10.2% over FY2009, 2.7% less than the Administration's request, and 2.0% more than the figure in the House-passed version. As in the budget request and the House-passed bill, funding for MEP would increase 13.4% to \$124.7 million and financing for TIP would increase 7.5% to 69.9 million. The \$163.9 million for construction represents a 4.7% decrease from FY2009, but 40.2% more than the Administration's budget figure and over twice that contained in H.R. 2847 as passed by the House.

No final FY2009 appropriations legislation was enacted by the close of the 110th Congress. P.L. 110-329, the Consolidated Security, Disaster Assistance, and Continuing Appropriations Act, 2009, provided, in part, funding for NIST at FY2008 levels through March 6, 2009. In the 111th Congress, P.L. 111-8, the FY2009 Omnibus Appropriations Act, funds NIST at \$819.0 million with the STRS account receiving a 7.2% increase to \$472.0 million (including the Baldrige Quality Program). Support for MEP totals \$110.0 million, a 22.8% increase, and financing for TIP remains constant at \$65.0 million. The \$172.0 million for the construction budget reflects a 7.2% increase in funding.

The American Recovery and Reinvestment Act of 2009, P.L. 111-5, provided an extra \$222.0 million for the STRS account to be used for "research, competitive grants, additional research fellowships and advanced research and measurement equipment and supplies," as noted in the Joint Explanatory Statement of the Committee on Conference. An additional \$360.0 million was included for construction, of which \$180.0 million "shall be for the competitive construction grant program for research science buildings." The law also directed the transfer of \$20.0 million from the Health Information Technology initiative to NIST to "create and test standards related to health security and interoperability in conjunction with partners at the Department of Health and Human Services," according to the Joint Statement.

As part of the American Competitiveness Initiative, the Bush Administration stated its intention to double over 10 years funding for "innovation-enabling research" performed at NIST through its "core" programs (defined as internal research in the STRS account and the construction budget). To this end, the former President's FY2007 budget requested an increase of 18.3% for intramural R&D at NIST; FY2007 appropriations for these in-house programs increased 9.6%. For FY2008, the omnibus appropriations legislation provided for a small increase in the STRS account. This was in contrast to the Bush Administration's FY2008 budget which included a 15.2% increase in funding, as did the original appropriations bill, H.R. 3093 (110th Congress), as passed by the House, while the Senate-passed version contained a 15.6% increase. The former President's FY2009 budget request proposed a 21.5% increase in support for the STRS account. Increases in the STRS account were included in the House and Senate appropriations bills during the 110th Congress, but at amounts less than the budget request. In the 111th Congress, the Omnibus Appropriations Act, 2009 bill provides a 7.2% increase to both the STRS account and construction, while the American Recovery and Reinvestment Act of 2009 provides significant additional funding for both initiatives. President Obama's FY2010 budget proposal includes a 13.3% increase in funding for the STRS account while there would be a 32.0% decline in the financing of construction. H.R. 2847, as passed by the House, contains an 8.1% increase in support for the STRS account but reduces funding for construction by more than half. The version

of H.R. 2847 reported from the Senate Committee on Appropriations provides 10.2% more for STRS in-house R&D while financing for construction would decline 4.7% from the current fiscal year.

Continued funding for the extramural programs at NIST has been a major issue. Support for the Advanced Technology Program was uncertain particularly because opponents objected to large companies receiving research grants. Although Congress maintained (often decreasing) funding for ATP, the initial appropriation bills passed by the House since FY2002 failed to include financing for the program. In FY2006, support for the program was cut 41% and in FY2007, P.L. 110-69 replaced ATP with the Technology Innovation Program, which focuses on small and medium sized firms. The Consolidated Appropriations Act, FY2008, provided funding for this new initiative. The Bush Administration's FY2009 budget request did not include financing for TIP, while the House and Senate bills provided support similar to FY2008. The budget for the Manufacturing Extension Partnership, another extramural program administered by NIST, has also been debated for several years. The former President's FY2009 budget proposal recommended curtailing the federally funded portion of the MEP and provided \$2.0 million to accomplish this objective. During the 110th Congress, the House and Senate appropriation bills included large increases in funding for the program; the FY2009 Omnibus Appropriations Act provided a 22.8% increase in MEP financing while TIP funding remained constant. The President's FY2010 budget request and H.R. 2847, both as passed by the House and reported from the Senate Committee on Appropriations, include a 13.4% increase in support for MEP and a 7.5% increase in funding for TIP.

For additional information, see CRS Report 95-30, *The National Institute of Standards and Technology: An Appropriations Overview*; CRS Report RS22815, *The Technology Innovation Program*; and CRS Report 97-104, *Manufacturing Extension Partnership Program: An Overview*, all by Wendy H. Schacht.

Table 11. NIST
(in millions of dollars)

NIST Program	FY2008 P.L. 110-161	FY2009 P.L. 111-8	ARRA^a P.L. 111-5	FY2010 Request	H.R. 2847 House	H.R. 2847 Sen. Cte.
STRS ^b	440.5	472.0	220.0	534.6	510.0	520.3
TIP/ATP	65.2 ^c	65.0		69.9	69.9	69.9
MEP	89.6	110.0		124.7	124.7	124.7
Construction	160.5	172.0	360.0	116.9	76.5	163.9
HIT ^d			20.0			
NIST Total^e	755.8	819.0	600.0	846.1	781.1	878.8

Sources: NIST website (available at http://www.nist.gov/public_affairs/budget.htm), P.L. 110-161, P.L. 111-8, P.L. 111-5, Budget Request, H.R. 2847, as passed by House, and H.R. 2847, as reported by Senate Committee on Appropriations.

Notes:

- a. Includes FY2009 and FY2010 funding.
- b. Includes funding for the Baldrige National Quality Program.
- c. Funding is for the new Technology Innovation Program (TIP) that replaced ATP.

- d. Transferred from Department of Health and Human Services for Health Information Technology Initiative.
- e. Figures may not add up because of rounding.

National Oceanic and Atmospheric Administration⁴⁷

The National Oceanic and Atmospheric Administration's (NOAA) R&D efforts focus on three areas: climate; weather and air quality; and ocean, coastal and Great Lakes resources. For FY2010, President Obama requested \$568 million in R&D funding for NOAA, a 7.0% decrease in funding from the FY2009 appropriation level of \$611 million. R&D accounts for nearly 12.7% of NOAA's total FY2010 discretionary FY2010 budget request of \$4.474 billion. The R&D request consists of approximately 93% research funding and 7% development funding. About 73% of the R&D request would fund intramural programs and 27% would fund extramural programs.

NOAA's administrative structure has evolved into five line offices that reflect its diverse mission including the National Ocean Service (NOS), the National Marine Fisheries Service (NMFS), the National Environmental Satellite, Data, and Information Service (NESDIS), the National Weather Service (NWS), and the Office of Oceanic and Atmospheric Research (OAR). In addition to NOAA's five line offices, Program Support (PS), a cross-cutting budget activity, includes the Office of Marine and Aviation Services (OMAO). The OAR request of \$305.9 million is 53.9% of the total NOAA FY2010 R&D request. This is nearly the same as the FY2009 OAR appropriation of \$307.1 million. The President's budget includes \$60.4 million for NOS R&D, \$2.1 million less than FY2009 (-3.4%), and \$27.6 million for NESDIS, a decrease of approximately \$0.8 million (-2.8%). NWS R&D funding would decrease by \$9.4 million to \$14.3 million (-39.7%) and OMAO funding would fall to \$104.0 million, down \$35.0 million (-25.2%). The Administration request would expand R&D funding for NMFS, proposing \$55.4 million, an increase of \$4.9 million (9.7%) (Table 12).⁴⁸

The NOAA FY2010 Budget Summary also breaks down R&D funding according to: ecosystems, 32%; climate, 31%; weather and water, 14%; commerce and transportation, 1%; and mission support (22%).⁴⁹ R&D accomplishments highlighted by NOAA include upgrading the NOAA operation prediction system; developing fishery bycatch reduction devices; predicting harmful algal blooms in the Great Lakes; integrating radar data to enhance weather forecasts and warnings; and implementing the soil moisture observational network.⁵⁰

On June 18, 2009, the House passed the Commerce, Justice, Science, and Related Agencies (CJS) FY2010 appropriations bill which recommended funding of \$4.603 billion for NOAA. This would provide an increase of 5.5% from the FY2009 enacted funding level of \$4.365 billion and a 2.9% increase over the Administration's request of \$4.474 million. On June 25, 2009, the Senate Appropriations Committee reported CJS FY2010 appropriations and recommended funding of

⁴⁷ This section was written by Harold F. Upton, Analyst in Natural Resources Policy, CRS Resources, Science, and Industry Division.

⁴⁸ Emily Larkin, NOAA Budget Office, personal communication, May 29, 2009.

⁴⁹ National Oceanic and Atmospheric Administration, *National Oceanic and Atmospheric Administration FY 2010 Budget Summary*, National Oceanic and Atmospheric Administration, Washington, DC, May 11, 2009, http://www.corporateservices.noaa.gov/~nbo/FY10_BlueBook/bb2k10_toc_Intro.pdf.

⁵⁰ Ibid.

\$4.773 billion for NOAA. This represents an increase of 9.3% compared to the FY2009 enacted level and an increase of 6.7% over the Administration's request.⁵¹

On March 11, 2009, the Omnibus Appropriations Act, 2009 (P.L. 111-8) was signed by President Obama. The act provided \$611 million in R&D funding for NOAA, an increase of \$30 million (5.2%) above its FY2008 R&D funding level.⁵² In addition, on February 13, 2009, the 111th Congress passed the American Recovery and Reinvestment Act (ARRA) of 2009 (H.R. 1), also referred to as the stimulus package. With ARRA providing \$830 million to NOAA, \$500,000 of this funding (provided to NWS) was classified as R&D.⁵³

Table 12. NOAA R&D

(in millions of dollars)

R&D by NOAA Line Office	FY2008 Enacted	FY2009 Omnibus (P.L. 111-8)	ARRA (P.L. 111-5)	FY2010 Request
National Ocean Service (NOS)	72.5	62.5	0	60.4
National Marine Fisheries Service (NMFS)	38.5	50.5	0	55.4
Oceanic and Atmospheric Research (OAR)	318.9	307.1	0	305.9
National Weather Service (NWS)	25.9	23.7	0.5	14.3
National Environmental Satellite Data and Information Service (NESDIS)	27.9	28.4	0	27.6
Office of Marine and Aviation Services (OMAO)	97.0	139.0	0	104.0
Total R&D^a	\$581	\$611	\$0.5	\$568

Sources: National Oceanic and Atmospheric Administration, *National Oceanic and Atmospheric Administration FY 2010 Budget Summary*, National Oceanic and Atmospheric Administration, Washington, DC, May 11, 2009, http://www.corporateservices.noaa.gov/~nbo/FY10_BlueBook/bb2k10_toc_Intro.pdf.

Emily Larkin, NOAA Budget Office, personal communication, May 29, 2009 and September 21, 2009.

Note:

- a. Totals may differ from the sum of the components due to rounding.

⁵¹ R&D breakdowns for House and Senate actions are not available.

⁵² Rep. David R. Obey, "Explanatory Statement Submitted by Mr. Obey, Chairman of the House Committee on Appropriations, Regarding H.R. 1105, Omnibus Appropriations Act, 2009," House, *Congressional Record*, daily edition, vol. 155 (February 23, 2009), pp. H1737-H1762 and Emily Larkin, NOAA Budget Office, Personal Communication, May 29, 2009.

⁵³ Emily Larkin, NOAA Budget Office, personal communication, May 29, 2009.

National Aeronautics and Space Administration⁵⁴

The Administration has requested \$13.709 billion for NASA R&D in FY2010. This request is a 5.6% increase over FY2009, in a total NASA budget that would increase by 5.1%.⁵⁵ The House bill (H.R. 2847 as passed by the House) would provide \$13.161 billion. The Senate bill (H.R. 2847 as reported) would provide \$13.714 million. For details, see **Table 13**.

For several years, budget priorities throughout NASA have been driven by the Vision for Space Exploration. Announced by President Bush in January 2004 and endorsed by Congress in the NASA Authorization Act of 2005 (P.L. 109-155) and the NASA Authorization Act of 2008 (P.L. 110-422) the Vision includes returning the space shuttle to regular flight status following the 2003 *Columbia* disaster (already accomplished), but then retiring it by 2010; completing the International Space Station, but discontinuing its use by the United States by 2017; returning humans to the Moon by 2020; and then sending humans to Mars and “worlds beyond.” The priorities established by the Vision are now in question. It is doubtful whether the future-year spending plans provided in NASA’s FY2010 budget documents can accommodate the 2020 goal for returning humans to the moon, and the Administration has announced an independent review of NASA’s human spaceflight activities, following which it intends to submit a revised FY2010 budget request for the Exploration account.

The requested \$4.477 billion for Science in FY2010 is a 0.6% decrease.⁵⁶ Within this total, increases for Earth Science, Planetary Science, and Heliophysics would be offset by a decrease for Astrophysics. In Earth Science, NASA is considering its options following the loss of the Orbital Carbon Observatory (OCO), which was launched in February 2009 but failed to reach orbit. Building a replacement for OCO is one of the options being examined, but the funding that would be required is not included in the request. In Astrophysics, two missions of particular congressional interest, the NASA/Department of Energy Joint Dark Energy Mission (JDEM) and the Space Interferometry Mission (SIM), are proceeding with technology development and awaiting advice from a decadal survey by the National Research Council. The House bill would increase Earth Science by \$15 million and Astrophysics by \$50 million; these increases would be partially offset by transfers of administrative and construction costs to other accounts, for a net increase in Science of \$19 million above the request. The Senate-reported bill would increase Astrophysics by \$49 million and Heliophysics by \$42 million; these increases would be offset by a reallocation of unobligated balances from prior years, for a net increase in Science of \$40 million above the request.

The \$3.963 billion requested for Exploration in FY2010 is a 13.1% increase,⁵⁷ as the Constellation Systems program ramps up its development of the Orion crew vehicle and Ares I launch vehicle, successors to the space shuttle. According to NASA, the FY2010 request for Constellation Systems (and the accompanying funding projections for FY2011 through FY2014)

⁵⁴ This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

⁵⁵ If the FY2009 baseline is taken to include funding from the Recovery Act, then the FY2010 request for NASA R&D is a 1.6% decrease in a total NASA budget that would decrease 0.5%.

⁵⁶ Or an 8.7% decrease if the FY2009 baseline is taken to include funding from the Recovery Act.

⁵⁷ Or a 1.5% increase if the FY2009 baseline is taken to include funding from the Recovery Act.

is consistent with achieving a first crewed flight for Orion and Ares I—known as an initial operating capability—in March 2015. It is doubtful, however, whether the projected FY2010-FY2014 funding for development of the heavy-lift Ares V launch vehicle, the Altair lunar lander, and lunar surface systems is consistent with returning humans to the moon by 2020. The independent review of NASA's human spaceflight program is expected to report by August 2009. More information on the review can be found on NASA's website, hsf.nasa.gov. The House bill would provide \$670 million less than the request for Exploration. The House committee report (H.Rept. 111-149) describes this as a deferral without prejudice, in light of the ongoing review, that “should not be viewed ... as a diminution of the Committee's support for NASA's human space flight program.” The Senate-reported bill would provide \$23 million less than the request, including the full requested amount for Orion and Ares I, an increase of \$75 million for Ares V, a reduction of \$46 million for Advanced Capabilities, and a reallocation of \$52 million in unobligated balances from prior years.

The House bill would make most NASA R&D funds available for one year, rather than the usual two. Approximately 10% of most accounts would continue to be available for two years. The Senate bill would make all NASA funds available for two years.

Table 13. NASA R&D

(in millions of dollars)

	FY2008	FY2009 Regular	FY2009 ARRA	FY2010 Request	FY2010 House	FY2010 Sen. Cte.
Science	\$4,733	\$4,503	\$400	\$4,477	\$4,496	\$4,517
<i>Earth Science</i>	1,237	1,380	325	1,405	1,443	1,405
<i>Planetary Science</i>	1,313	1,326	—	1,346	1,348	1,355
<i>Astrophysics</i>	1,396	1,206	75	1,121	1,171	1,170
<i>Heliophysics</i>	788	592	—	605	605	647
<i>Adjustments</i>	—	—	—	—	(71)	(59)
Aeronautics	511	500	150	507	501	507
Exploration ^a	3,299	3,506	400	3,963	3,293	3,940
<i>Constellation Systems</i>	2,676	3,033	400	3,505	2,919	3,580
<i>Advanced Capabilities</i>	624	472	—	458	477	412
<i>Adjustments</i>	—	—	—	—	(103)	(52)
International Space Station	1,686	2,060	—	2,267	2,267	2,267
Subtotal R&D	10,229	10,569	950	11,214	10,557	11,231
Other NASA Programs ^b	3,921	3,907	2	4,071	4,040	4,071
Construction & Environ. ^c	—	—	—	—	442	—
<i>Associated with R&D</i>	—	—	—	—	319	—
<i>Associated with Other</i>	—	—	—	—	123	—
Cross-Agency Support ^c	3,251	3,306	50	3,401	3,164	3,384
<i>Associated with R&D</i>	2,350	2,414	—	2,495	2,285	2,483
<i>Associated with Other</i>	901	892	50	906	879	900

	FY2008	FY2009 Regular	FY2009 ARRA	FY2010 Request	FY2010 House	FY2010 Sen. Cte.
Total R&D	12,579	12,983	950	13,709	13,161	13,714
Total NASA	17,402	17,782	1,002	18,686	18,203	18,686

Source: NASA FY2010 congressional budget justification, online at <http://www.nasa.gov/news/budget/>; H.R. 2847 as passed by the House and as reported by the Senate Appropriations Committee; H.Rept. 111-149; and S.Rept. 111-34.

Notes:

- The FY2010 request for Exploration is tentative. The Administration has stated that it will be revised following the results of the human spaceflight review.
- Includes Space Shuttle, Space and Flight Support, Education, and Inspector General.
- Allocation between R&D and non-R&D is estimated by CRS in proportion to the underlying program amounts (except FY2009 ARRA) in order to allow calculation of a total for R&D. The Cross-Agency Support account consists mostly of indirect costs for other programs assessed in proportion to their direct costs. The House bill's new Construction and Environmental Compliance and Remediation account consists mostly of activities included in Cross-Agency Support in the other columns.

Department of Agriculture⁵⁸

The FY2010 request for research and education activities in the U.S. Department of Agriculture (USDA) is \$2.738 billion, a decrease of \$54.0 million (-1.9%) from the FY2009 estimate of \$2.792 billion (see **Table 14**). The Agricultural Research Service (ARS) is USDA's in-house basic and applied research agency, and operates approximately 100 laboratories nationwide. The ARS laboratories focus on efficient food and fiber production, development of new products and uses for agricultural commodities, development of effective biocontrols for pest management, and support of USDA regulatory and technical assistance programs. Included in the total support for USDA in FY2010 is \$1.173 billion for ARS, \$33.6 million below the FY2009 estimate. In ARS, the Administration is proposing a reduction of \$40.0 million in funding add-ons designated by Congress for research at specific locations. The amounts from the discontinued projects would be redirected to critical research priorities of the Administration that include genetic and genomic databases, expansion of domestic and global market opportunities, development of new varieties and hybrids of feedstocks, addressing animal health and feed efficiency, and the development of new healthier foods with decreased caloric density. Included in the FY2010 request for ARS is \$20.0 million for buildings and facilities.

The National Institute of Food and Agriculture (NIFA), currently the Cooperative State Research, Education, and Extension Service (CSREES), was established in Title VII, Section 7511 of the 2008 Farm Bill. The NIFA will be effective September 20, 2009, and will be responsible for developing linkages between the federal and state "components of a broad-based, national agricultural research, extension, and higher education system."⁵⁹ NIFA distributes funds to State Agricultural Experiment Stations, State Cooperative Extension Systems, land-grant universities, and other institutions and organizations that conduct agricultural research, education, and

⁵⁸ This section was written by Christine M. Matthews, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

⁵⁹ U.S. Department of Agriculture, *U.S. Department of Agriculture FY201 Budget Summary and Annual Performance*, May 2009, p. 94.

outreach. Included in these partnerships is funding for research at 1862 land-grant institutions, 1890 historically black colleges and universities, 1994 tribal land-grant colleges, and Hispanic-serving institutions. Funding is distributed to the states through competitive awards, statutory formula funding, and special grants. The FY2010 request provides \$1.320 billion for NIFA, a decrease of \$32.7 million from the FY2009 estimate. The NIFA FY2010 budget includes the proposed elimination of \$128.0 million in Congressional add-ons. Funding for formula distribution in FY2010 to the state Agricultural Experiment Stations is \$288.5 million, almost level with the FY2009 estimate. One of the primary goals of the President's FY2010 NIFA request is to expand competitive, peer-reviewed allocation of research funding. Programs will be designed that are more responsive to critical national issues such as agricultural security, local and regional emergencies, zoonotic diseases, and pest risk management. Support is given for a competitive program directed at developing training and expanding use of web-based and other technology applications. Funding would be provided also for programs that improve the quality of rural life and that provide stress assistance programs to individuals engaged in agriculture-related occupations.

The FY2010 request proposes \$201.5 million for the Agriculture and Food Research Initiative (AFRI), level funding with the FY2009 estimate. In addition to supporting fundamental and applied science in agriculture, USDA maintains that the AFRI makes a significant contribution to developing the next generation of agricultural scientists by providing graduate students with opportunities to work on research projects. A focus of these efforts is to provide increased opportunities for minority and under-served communities in agricultural science. AFRI funding is to support projects directed at developing alternative methods of biological and chemical conversion of biomass, and research on the impact of a renewable fuels industry on the economic and social dynamics of rural communities. The Administration has proposed support for initiatives in agricultural genomics, emerging issues in food and agricultural security, the ecology and economics of biological invasions, and plant biotechnology. Research is proposed that moves beyond water quality issues to extend to water availability, reuse, and conservation.

The FY2010 request for USDA provides \$82.5 million for the Economic Research Service (ERS), \$2.5 million above the FY2009 estimated level. ERS supports both economic and social science information analysis on agriculture, rural development, food and the environment. ERS collects and disseminates data concerning USDA programs and policies to various stakeholders. Funding for the National Agricultural Statistics Service (NASS) is proposed at \$161.8 million in the FY2010 request, \$9.8 million above FY2009. The budget includes support to improve research efforts in analyzing the impacts of bioenergy production, and to examine concerns pertaining to feedstock storage, transportation networks, and the vagaries in commodity production. Additional research areas include production and utilization of biomass materials; stocks and prices of distillers' grains; and current and proposed ethanol production plants. Funding for NASS will allow for the restoration of the chemical use data series on major row crops; post harvest chemical use; and alternating annual fruit, nuts, and vegetable chemical use. Also, funding has been provided to fully fund the first year of the 2012 Census of Agriculture's five year cycle. Data from the Census of Agriculture will be used to measure trends and new developments in the agricultural community.

In the 111th Congress, President Obama signed into law the American Recovery and Reinvestment Act of 2009 (P.L. 111-5) (ARRA). The law increased USDA's FY2009 funding by \$28.0 billion. Included in ARRA funds for USDA was \$128.0 million for ARS buildings and facilities that is characterized as funding for R&D facilities.

On October 7, 2009, the House agreed to the conference report on the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, FY2010 (H.R. 2997, H.Rept. 111-279). The Senate agreed to the conference report on October 8, 2009. On October 21, 2009, President Obama signed the act into law (P.L. 111-80), providing \$2.981 billion for USDA research and education for FY2010, \$243.8 million above the Administration's request and \$189.8 million above the FY2009 estimate. The funding includes \$1.251 billion for the ARS, \$77.1 million above the request, and \$1.487 billion for NIFA, \$166.7 million above the Administration's request. The act provides the same level of funding for the ERS and the NASS as the Administration, \$82.5 million and \$161.8 million respectively.

Table 14. U.S. Department of Agriculture R&D

(in millions of dollars)

	FY2009 Estimate	FY2009 ARRA	FY2010 Request^a	FY2010 House	FY2010 Senate	FY2010 Enacted
Agricultural Research Service (ARS)						
Product Quality/Value Added	\$103.0		\$116.0			
Livestock Production	80.0		83.0			
Crop Production	200.0		205.0			
Food Safety	106.0		108.0			
Livestock Protection	75.0		76.0			
Crop Protection	199.0		200.0			
Human Nutrition	79.0		92.0			
Environmental Stewardship	220.0		234.0			
National Agricultural Library	21.0		22.0			
Repair, Maintenance, and Other Programs	104.0		17.0			
Subtotal	1,187.0		1,153.4	1,155.6	1,181.6	1,179.6
Buildings and Facilities	20.0	128.0	20.0	35.0	47.0	70.9
Total, ARS	1,207.0	128.0	1,173.4	1,190.6^b	1,228.6^f	1,250.5
National Institute of Food and Agriculture (NIFA)^c						
Hatch Act Formula	207.0		207.1	215.0	215.0	215.0
Cooperative Forestry Research	28.0		27.5	28.0	30.0	29.0
Earmarked Projects and Grants	128.0		0.0	69.7	50.5	120.0
Agriculture & Food Research Initiative	202.0		201.5	210.0	296.7	262.5
Federal Administration	19.0		21.0	27.2	25.1	45.1
Higher Education Programs ^d	43.0		84.0	74.8	48.1	48.4
Other Programs	64.0		81.0	83.3	92.4	68.2
Total, Research and Education Activities^e	691.0		622.1	708.0	757.8	788.2
Extension Activities						

	FY2009 Estimate	FY2009 ARRA	FY2010 Request ^a	FY2010 House	FY2010 Senate	FY2010 Enacted
Smith-Lever Sections 3b&c	288.0		288.5	295.0	300.0	297.5
Extension and Integrated Programs	38.0		38.0	38.0	38.0	42.7
1890 Colleges, Tuskegee, & West Virginia State University Colleges	86.0		86.0	86.0	59.9	62.4
Other Extension Programs	62.0		74.0	66.5	93.4	92.3
Total, Extension Activities	474.0		486.5	485.5	491.3	494.9
Integrated Activities	57.0		56.9	60.0	56.9	60.0
Outreach for Socially Disadvantaged Farmers	0.0		0.0	0.0	0.0	0.0
Native American Endowment Fund Interest	4.0		11.8	11.9	11.9	11.9
Mandatory Programs	127.0		143.0	132.0	132.0	132.0
Total, NIFA^e	1,353.0		1,320.3	1,397.4	1,449.9	1,487.0
Economic Research Service	80.0		82.5	82.5	82.1	82.5
National Agricultural Statistics Service	152.0		161.8	161.8	161.8	161.8
Total, Research, Education, and Economics	2,792.0		2,738.0	2,832.3	2,922.4	2,981.8

Sources: U.S. Department of Agriculture FY2010 Budget Summary and Annual Performance Plan.

Notes: Research activities carried out in support of Homeland Security are reflected under the Food Safety, Livestock Protection, and Crop Protection program areas—FY2008, \$35.5 million; and FY2009, \$64.3 million.

- a. Funding levels are contained in the U.S. Department of Agriculture FY2010 Budget Summary and Annual Performance Plan, May 2009. USDA received approximately \$28.0 billion from the American Recovery and Reinvestment Act, 2009 (ARRA). Included in that total was \$128.0 million for ARS facilities. No ARRA funding has been included in the FY2009 column totals.
- b. H.R. 2997, H.Rept. 111-181. Funding levels within ARS are not yet available.
- c. Formerly CSREES. NIFA was established in Title VII of the 2008 Farm Bill.
- d. Higher Education includes capacity building grants, Hispanic-Serving Institution Education Grants Program, Two-Year Postsecondary, and Agriculture in the K-12 Classroom, Higher Education Challenge Grants, Improve the Quality of Life in Rural America, and others.
- e. Program totals may or may not include set-asides (non-add) or contingencies.
- f. S.1406, S.Rept. 111-39. Funding levels within ARS are not yet available.

Department of the Interior⁶⁰

President Obama has requested \$745.1 million for Department of the Interior (DOI) R&D in FY2010, an estimated increase of \$44.6 million (8.6%) from FY2009 funding of \$700.5 million (see **Table 15**). The U.S. Geological Survey (USGS) is the primary supporter of R&D within DOI, accounting for approximately 87% of the department's total R&D appropriations. President Obama has proposed \$649.3 million for USGS R&D in FY2010, an increase of \$37.2 million (6.1%) from the estimated FY2009 level. This increase is due largely to additional funding requested for three secretarial initiatives—Climate Impacts, A New Energy Frontier, and Changing Arctic Ecosystems—as well as for adjustments for fixed costs and inflation.

In FY2009, the American Recovery and Reinvestment Act (P.L. 111-5) provided an additional \$140 million to USGS for R&D related activities such as repair, construction and restoration of facilities; equipment replacement and upgrades; national map activities; and other deferred-maintenance and improvement projects.

USGS R&D is conducted under several activity/program areas: geographic research, geological resources, water resources, biological research, enterprise information, and global change. The President's FY2010 request includes increases in each of these areas, though 83.2% of the total USGS R&D increase is in two areas, biological research and global change.

USGS geographic research efforts seek to describe and interpret America's landscape by mapping the nation's terrain, monitoring changes over time, and analyzing how and why these changes have occurred. President Obama's FY2010 budget for geographic research R&D proposes a \$0.8 million increase (1.7%) to \$46.3 million.

Funding for USGS geological resources R&D in FY2010 would increase by \$4.7 million (2.2%) to \$220.5 million from its estimated FY2009 level. The Geological Resources Program assesses the availability and quality of the nation's energy and mineral resources. The Geological Resources Program researches, monitors, and assesses the landscape to understand geological processes to help distinguish natural change from those resulting from human activity. Within the earth sciences, the USGS plays a major role in important geological hazards research, including research on earthquakes and volcanoes. Enterprise Information conducts information science research to enhance the National Map and National Spatial Data infrastructure.

USGS water resources R&D is focused on water availability, water quality and flood hazards. President Obama's FY2010 budget for water resources R&D proposes a \$0.7 million increase (0.6%) to \$124.0 million.

USGS biological research efforts seek to generate and distribute scientific information that can assist in the conservation and management of the nation's biological resources. President Obama's FY2010 budget request for biological research R&D proposes an increase of \$13.5 million (7.2%) to \$199.3 million. The USGS Biological Research program serves as DOI's biological research arm, using the capabilities of 17 research centers and associated field stations,

⁶⁰ This section was written by John F. Sargent, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

one technology center, and 40 cooperative research units that support research on fish, wildlife, and natural habitats. Major research initiatives are carried out by USGS scientists who collect scientific information through research, inventory, and monitoring investigations. These activities develop new methods and techniques to identify, observe, and manage fish and wildlife, including invasive species and their habitats.

Global climate change R&D would receive the largest boost in the USGS R&D budget, rising \$17.5 million (43.2%) to \$58.2 million in FY2010 under President Obama's FY2010 budget request. Enterprise information R&D would receive a small increase in FY2010 to \$1.1 million.

Among the other DOI agencies, the Minerals Management Service would receive \$44.1 million in FY2010, an increase of \$5.3 million (13.8%) over the FY2009 appropriated level. This funding level includes a \$4.8 million increase for the agency's Environmental Studies Program and a reduction of \$900,000 through the elimination of congressionally-directed funding provided in FY2009 for the Center for Marine Resources and Environmental Technology. The National Park Service would receive \$29.0 million in FY2010, \$2.5 million (9.4%) more than in FY2009. The Bureau of Reclamation would receive \$12.9 million in FY2010, an increase of \$0.7 million (5.8%) over FY2009 funding. The Bureau of Land Management would receive \$9.7 million in FY2010, a decrease of \$1.3 million (-11.8%) below FY2009 funding.

Research and development funding in the Department of the Interior appropriations is incorporated in funding lines that include additional activities. It is generally not possible to determine how much of the funds included in appropriations bills will be allocated to research and development activities.

While only limited data on R&D funding is provided in the House bill and the accompanying report, overall funding for USGS may provide a bellwether of how DOI R&D has fared as approximately half of the USGS budget funds R&D and USGS accounts for the vast majority of DOI R&D (87.4% in FY2009). On June 26, the House passed the Department of the Interior, Environment, and Related Agencies Appropriations Act, 2010 (H.R. 2996). The bill would provide USGS a total of \$1.106 billion for FY2010, an increase of \$61.9 million (5.9%) above the FY2009 level and \$7.9 million (0.8%) above the President's request.⁶¹ H.Rept. 111-180 notes that the bill provides the requested \$22.0 million increase for climate change science and \$3.0 million increase for the New Energy Frontier initiative on alternative energy research. Each of the USGS line items were funded at or above both the FY2009 enacted level and the President's request.

On September 24, 2009, the Senate passed an amended version of H.R. 2996. The bill would provide USGS a total of \$1.104 billion for FY2010, an increase of \$60.5 million, or 5.8%, above the FY2009 level and \$6.5 million (0.6%) above the President's request, including increases of \$22 million for expanded global climate change research; \$5 million to enhance the National Streamgange Network; \$3 million for renewable energy research; and \$4.1 million for Arctic ecosystems research. The bill and reports provide insufficient detail to parse R&D funding from other DOI activities.⁶²

⁶¹ U.S. Congress, House Committee on Appropriations, *Department of the Interior, Environment, and Related Agencies Appropriation Bill, 2010*, Report to accompany H.R. 2996, 111th Cong., 1st sess., June 23, 2009, H.Rept. 111-180.

⁶² U.S. Congress, Senate Committee on Appropriations, *Department of the Interior, Environment, and Related Agencies Appropriation Bill, 2010*, Report to accompany H.R. 2996, 111th Cong., 1st sess., July 7, 2009, S.Rept. 111-38.

(continued...)

Table 15. Department of the Interior R&D
(in millions of dollars)

	FY2008 Actual	FY2009 Enacted (P.L. 111-8)	ARRA (P.L. 111-5)	FY2010 Request	FY2010 House^a	FY2010 Sen. Cte.^a
U.S. Geological Survey	586.4	612.1		649.3	N/A	N/A
Geographic research	51.1	45.6		46.3	N/A	N/A
Geological resources	218.8	215.8		220.5	N/A	N/A
Water resources	128.1	123.2		124.0	N/A	N/A
Biological research	179.9	185.8		199.3	202.5	202.7
Global change	7.4	40.6		58.2	58.2	58.2
Enterprise information	1.1	1.0		1.1	N/A	N/A
Bureau of Land Management	10.6	11.0		9.7	N/A	N/A
Bureau of Reclamation	15.3	12.2		12.9	N/A	N/A
Minerals Management Service	32.8	38.8		44.1	N/A	N/A
National Park Service	25.3	26.5		29.0	N/A	N/A
Total R&D^b	670.5	700.5	140.0	745.1	N/A	N/A

Source: CRS analysis of unpublished data provided to CRS by the Department of the Interior budget office, June 22, 2009, unless otherwise noted.

Notes:

- a. S.Rept. 111-38.
- b. Totals may differ from the sum of the components due to rounding.

Environmental Protection Agency⁶³

The Environmental Protection Agency (EPA), the regulatory agency responsible for carrying out a number of environmental pollution control laws, funds a broad portfolio of R&D activities to provide the necessary scientific tools and knowledge to support decisions relating to preventing, regulating, and abating environmental pollution. Beginning in FY2006, EPA has been funded within the “Interior, Environment, and Related Agencies” appropriations bill. Most of EPA’s scientific research activities are funded within the agency’s Science and Technology (S&T) appropriations account. This account is funded by a “base” appropriation and a transfer from the Hazardous Substance Superfund (Superfund) account. These transferred funds are dedicated to research on more effective methods to clean up contaminated sites.

(...continued)

U.S. Senate Committee on Appropriations, “Summary: FY 2010 Interior, Environment Appropriations,” press release, June 25, 2009, http://appropriations.senate.gov/News/2009_06_25_Summary_of_FY_2010_Interior_Appropriations.pdf?CFID=3927976&CFTOKEN=18699508.

⁶³ This section was written by Robert Esworthy, Specialist in Environmental Policy, CRS Resources, Science, and Industry Division.

Title II of the Interior, Environment, and Related Agencies appropriations bill for FY2010 as passed by the House (H.R. 2996, H.Rept. 111-180) on June 26, 2009, would have provided \$876.5 million for the EPA S&T account, including transfers from the Superfund account. The amount for EPA's S&T account in the House bill represents 8.4% of the total \$10.463 billion included for EPA for FY2010. The House-passed funding for EPA's S&T account was a 7.3% increase above the FY2009 appropriation⁶⁴ of \$816.5 million, and 0.8% above the President's FY2010 request of \$869.2 million (see **Table 16**). H.R. 2996 as passed by the Senate on September 24, 2009, would have provided \$10.197 billion for EPA, including \$869.6 million (with transfers) for the S&T account. The Senate-passed amount for the S&T account was less than the amount passed in the House, but nearly the same as President's FY2010 request and 6.5% above the FY2009 appropriations for EPA's S&T.

The EPA S&T account incorporates elements of the former EPA Research and Development (R&D) account, as well as a portion of the former Salaries and Expenses, and Program Operations accounts, which had been in place until FY1996. Although the Office of Management and Budget (OMB) reports⁶⁵ historical and projected budget authority amounts for R&D at EPA (and other federal agencies), OMB documents do not describe how these amounts explicitly relate to the requested and appropriated funding amounts for the many specific EPA program activities. EPA's most recent annual appropriations have been requested, considered, and enacted according to eight statutory appropriations accounts, which were established by Congress during the FY1996 appropriations process. Because of the differences in the scope of the activities included in these accounts, apt comparisons before and after FY1996 are difficult to identify in historical trends in funding for EPA's R&D activities.

The S&T account funds research conducted by universities, foundations, and other non-federal entities with grants awarded by EPA, and research conducted by the agency at its own laboratories and facilities. These R&D activities are managed primarily by EPA's Office of Research and Development (ORD). A large portion of the S&T account funds these activities managed by ORD. However, the account also provides funding for the agency's applied science and technology activities conducted through its program offices (e.g., the Office of Water). Many of the programs implemented by other offices within EPA have a research component, but the research is not necessarily the primary focus of the program.

The House-passed bill and the Senate-passed bill, similar to the FY2010 President's request, reflected increases of varying levels when compared with the enacted FY2009 appropriations for nearly all of the individual EPA research program and activity line items identified within the S&T account. Research program areas for which there were increases for FY2010 in both bills include the climate protection program, clean air and air toxics research, global change research,

⁶⁴ Title VII of Division A of the American Recovery and Reinvestment Act of 2009 (P.L. 111-5, signed into law February 17, 2009) included a combined total of \$7.22 billion for EPA. However, P.L. 111-5 did not include funding for research activities within the agency's S&T appropriations account. For information on FY2009 funding for all EPA appropriations accounts see CRS Report RL34461, *Interior, Environment, and Related Agencies: FY2009 Appropriations*, coordinated by Carol Hardy Vincent.

⁶⁵ The Office of Management and Budget (OMB) reports R&D budget authority amounts in its Analytical Perspectives accompanying the annual President's budget, but amounts for specific programs are not included. For example, for EPA R&D, OMB reported actual budget authority of \$551 million for FY2008, an estimated amount of \$580 million for FY2009, and \$619 million proposed for FY2010. The R&D budget authority amounts reported by OMB are typically significantly less than amounts appropriated/requested for the S&T account. This is an indication that not all of the EPA S&T account funding is allocated to R&D. See OMB, *Fiscal Year 2010 Budget of the U.S. Government: Analytical Perspectives - Cross Cutting Programs*. <http://www.whitehouse.gov/omb/budget/>.

clean water research, and human health and ecosystem research. Many of these increases, with a few exceptions, were the same or similar to increases included in the President's FY2010 request. There are also increases and decreases when comparing the House and Senate -passed bills with the President's FY2010 request, and with each other.

As an example, the largest increase above FY2009 appropriations for an individual program area included in the House bill was \$250.4 million for human health and ecosystem research for FY2010. The amount in the House bill was \$21.0 million (9.2%) more than the \$229.4 million FY2009 enacted appropriation, and \$5.0 million above the President's FY2010 request of \$245.4 million.⁶⁶ The Senate bill included the same amount as requested for this program area for FY2010. The largest decrease for FY2010 in both bills within the S&T account compared to the President's request was for the Water Security Initiative, one of EPA's homeland security activities.⁶⁷ The \$18.7 million for this program activity included in both bills for FY2010 was above the FY2009 appropriations of \$15.0, but nearly \$5.0 million below the \$23.7 million requested for FY2010; a 21.1% decrease.

The operation and administration of the agency's laboratories and facilities necessitate significant expenditures for rent, utilities, and security. Prior to FY2007, a significant portion of the funding for these expenses had been requested and appropriated within EPA's Environmental Programs and Management (EPM) appropriations account. Beginning in FY2007 increasing portions of funding for these expenses were requested and appropriated within the S&T account. This change affects comparisons of the S&T appropriations over time. Funding for these latter expenses ranged from 8% to 11% of the total S&T account in the House and Senate recommendations for FY2010, the FY2010 President's request, and the FY2008 and FY2009 enacted appropriations. Comparatively, these expenses were less than 5% in the FY2007 appropriations and 1% in the FY2006 appropriations.⁶⁸

Some Members of Congress and an array of stakeholders have continually raised concerns about the adequacy of funding for scientific research at EPA. The adequacy of funding for EPA's scientific research activities has been part of a broader question about the adequacy of overall federal funding for a broad range of scientific research activities administered by multiple federal agencies. Some Members of Congress, scientists, and environmental organizations have expressed concern about the downward trend in federal resources for scientific research over time. The debate continues to center around the question of whether the regulatory actions of federal agencies are based on "sound science," and how scientific research is applied in developing federal policy.

⁶⁶ For explanation of research activities supported within this program area see EPA's FY2010 Annual Performance Plan and Congressional Justification (EPA's Proposed Budget): Science and Technology, beginning on p.130. <http://www.epa.gov/ocfo/budget/2010/2010cj.htm>.

⁶⁷ Under the Bioterrorism Act of 2002, and Homeland Security Presidential Directives 7, 9 and 10, EPA is the lead federal agency for coordinating security of the Nation's water systems, and plays a role in developing early warning monitoring and decontamination capabilities associated with potential attacks using biological contaminants.

⁶⁸ For example, for research alone (net after operations and administration expenses), the FY2008 consolidated appropriations included a \$6.4 million increase above the FY2008 request for the S&T account, but \$17.5 million less than the FY2007 appropriations (includes transfers from the Superfund account).

Table 16. Environmental Protection Agency S&T Account
(in millions of dollars)

	FY2008 Enacted (P.L. 110-161)	FY2009 Enacted (P.L. 111-8)	FY2010		
			President's Request	H.R. 2996 House	H.R. 2996 Senate
Science and Technology Appropriations Account					
—Base Appropriations	\$760.1	\$790.1	\$842.3	\$849.6	\$842.8
—Transfer in from Superfund Account	25.7	26.4	26.8	26.8	\$26.8
Science and Technology Total	785.8	816.5	869.2	876.5	869.6
—(Operations and Administration)	(71.5)	(73.8)	(72.9)	(72.9)	(72.9)
Net Science and Technology	714.3	742.6	796.3	803.6	796.8

Source: The FY2008 enacted amounts are from the explanatory statement presented in the House Appropriations Committee Print (unnumbered) on the Omnibus Appropriations Act, 2009, H.R. 1105/P.L. 111-8, p. 1256. FY2009 enacted, FY2010 requested, House-passed, and Senate-passed amounts are as reported by the Senate Committee on Appropriations (S.Rept. 111-38). Enacted amounts for FY2008 in the above table reflect a 1.56 % across-the-board rescission required in P.L. 110-161 for any discretionary appropriations in Division F Titles I through IV of the law (Division F Title IV § 437 of P.L. 110-161).

Note: Numbers may not add due to rounding.

Department of Transportation⁶⁹

President Obama has requested \$939 million for Department of Transportation (DOT) R&D in FY2010 (see **Table 17**).⁷⁰ Two DOT agencies—the Federal Highway Administration (FHWA) and the Federal Aviation Administration (FAA)—account for most of the department's R&D funding (more than 80% in FY2009).

President Obama has requested \$360 million for FAA R&D, 8.7% above the FY2009 enacted level. The request includes an increase in R&D funding for FAA's Next Generation Air Transportation System (NextGen) which is focused on addressing air traffic growth by increasing the nation's airspace capacity and efficiency and reducing emissions and noise. Funding for NextGen R&D line items in the FAA's Research, Development and Technology FY2010 budget would increase by \$39 million (37.3%) under the President's request compared to FY2009 funding.⁷¹

No specific figure is available for FHWA R&D funding in the President's FY2010 request. The Department of Transportation receives R&D funds through both the regular appropriations

⁶⁹ This section was written by John F. Sargent, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

⁷⁰ *A Renewed Commitment to Science and Technology: Federal R&D, Technology, and STEM Education in the 2010 Budget*, Office of Science and Technology Policy, The White House, May 7, 2009, available at <http://www.ostp.gov/galleries/budget/FY2010RD.pdf>.

⁷¹ *Budget Estimates FY2010*, Federal Aviation Administration, U.S. Department of Transportation, May 2009.

process as well as from the Transportation Trust Fund through authorization legislation.⁷² For example, P.L. 109-59, the Safe, Accountable, Flexible, Efficient Transportation Equity Act—A Legacy for Users (SAFETEA-LU), which became law in August 2005, set DOT surface transportation authorization levels for each fiscal year from FY2005 through FY2009, providing increased DOT R&D funding during this period. However, the SAFETEA-LU Act expires on September 30, 2009, presenting a challenge to agencies that receive funding through this mechanism in the preparation of their FY2010 budget. Thus, according to the Department of Transportation:

The [Obama] Administration is developing a comprehensive approach for surface transportation reauthorization. Consequently, the [FY2010] Budget contains no policy recommendations for programs subject to reauthorization [which includes R&D], including highway programs.⁷³

For this reason, the Federal Highway Administration and the National Highway Transportation Safety Administration (NHTSA) FY2010 budget justifications provide no specific data on R&D funding for FY2010. The Federal Transit Administration would see a \$0.9 million decrease in R&D funding in FY2010 under the President's budget, a decrease of 5.9% from FY2009. The R&D funding levels of other DOT agencies would remain essentially flat.

The House passed H.R. 3288, the Transportation, Housing and Urban Development, and Related Agencies Appropriations Act, 2010, on July 23, 2009. This bill is accompanied by H.Rept. 111-218. The Senate passed its version of the bill on September 17, 2009, accompanied by S.Rept. 111-69. There is insufficient information in these bills and reports to determine the level of R&D funding for the FHWA and FAA. Noting the Administration was still developing its reauthorization proposal for the various surface transportation programs at the time the President's FY2010 budget request was sent to Congress, H.Rept. 111-218 states:

The Committee is extremely frustrated by the lack of detail included in the budget justifications for all of the surface transportation agencies. Little or no information was provided as to how the resources requested in the budget would be spent or which underlying programs would be continued even under the funding scenario presented in the budget. The Committee would like to remind the Administration that these important details are necessary for the Committee to make the annual funding decisions that are under its jurisdiction. Failure to provide adequate information can have a detrimental impact on the resource levels that the Committee elects to provide the agency.⁷⁴

Both the House and Senate reports indicate that the funding levels provided in their respective bills assumes that the DOT transportation programs will be extended through FY2010 at the levels authorized for FY2009.

The Legislative Branch Appropriations Act, 2010 (P.L. 111-68), was signed into law by President Obama on September 30, 2009. Division B of the act, the Continuing Appropriations Resolution, 2010, extends the requirements, authorities, conditions, eligibilities, limitations, and other provisions of SAFETEA-LU, and authorizes, appropriates, and limits the use of funds for

⁷² Appropriators may add to or direct funds identified in authorization legislation.

⁷³ U.S. Department of Transportation, *U.S. Department of Transportation, Fiscal Year 2010 Budget Highlights*, May 2009, p. 1, <http://www.dot.gov/budget/2010/bib2010.pdf>.

⁷⁴ H.Rept. 111-218, pp. 82-32.

SAFETEA-LU programs (including R&D funds) at FY2009 levels until October 31, 2010, until the enactment into law of an appropriation for any project or activity provided for in P.L. 111-68, or until the enactment into law of an appropriation for any project or activity provided for in the act, or the enactment into law of the applicable appropriations act for FY2010 without any provision for such project or activity, whichever occurs first.

Table 17. Department of Transportation R&D

(in millions of dollars)

	FY2008 Enacted	FY2009 Enacted	FY2010 Request	House	Senate
Federal Highway Administration ^a	426	422	N/A	N/A	N/A
Federal Aviation Administration ^b	269	331	360	N/A	N/A
Other agencies ^c	179	163	N/A	N/A	N/A
Total^d	874	917	939	N/A	N/A

Source: R&D estimates are from DOT agency budget justifications and unpublished tables provided by OMB to CRS in May 2009.

Notes: N/A = not available

- a. *Budget Estimates FY2010*, Federal Highway Administration, U.S. Department of Transportation, May 2009; the FY2010 FHWA R&D funding request is not available.
- b. *Budget Estimates FY2010*, Federal Aviation Administration, U.S. Department of Transportation, May 2009.
- c. "Other agencies" includes National Highway Traffic Safety Administration, Federal Railroad Administration, Federal Transit Administration, Research and Innovative Technology Administration, Federal Motor Carrier Safety Administration, Pipeline and Hazardous Materials Safety Administration, and the Office of the Secretary. NHTSA R&D funding data for FY2008 and FY2009 are from unpublished OMB tables; the FY2010 NHTSA R&D funding request is not available.
- d. Totals may differ from the sum of the components due to rounding.

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